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THE GREAT AMAZON:

PERSONAL INVESTIGATIONS ON THE RIVER, AND IN ITS
UPPER VALLEY.

BY

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Over three hundred and fifty years ago Lope de Aguirre, writing to Philip II. of Spain, concluded his report on a voyage down the Amazon by saying, "God knows how we got through that great mass of water. I advise thee, O great king, never to send Spanish fleets into that cursed river." A later monarch heard more pleasant news when, in 1639, Padre Cristoval de Acuña declared: "If the Amazons then is the chief street, the principal road by which to ascend to the greater riches of Peru, well may I affirm that she is the chief *master* of all those riches. If the Lake of Dorado contains the gold which common opinion attributes to it; if, as many affirm, the Amazons inhabit the richest country in the world; if the Tocantins are so famous for their gold and precious stones; if the Omaguas were so famous for their riches that a viceroy of Peru despatched

a force under Pedro de Orsua in search of them ; then all this wealth is now shut up in the great river Amazons. Here is the Lake of Dorado ; here the nation of the Omaguas ; and here, finally, is deposited the immense treasure which the Majesty of God keeps to enrich our great king and lord, Philip Fourth."

The fabled El Dorado retreated from the Amazon, shrunk from one unpenetrated wilderness to another, as explorers unlocked their secrets, until at last it vanished from the earth ; but subsequent generations have not found cause to reiterate the pessimistic utterances of Aguirre. Still, in all parts of the world, the name of the Amazon calls forth eulogistic apostrophes, and men are so lost in admiration of its *greatness* that they fail to comprehend its utility. The Mississippi is not talked about and marvelled at so much by half in the present decade as it was forty years ago. Sceptics then doubted whether the railroads would ever be more than an expensive toy, and the great river of the West was looked upon as the natural channel of trade, but it is precisely in these days, when the *railroads* have developed the mighty resources of the Mississippi Valley, and the river that drains it has *ceased* to be the epos of patriotic poets, that the Mississippi is accomplishing its highest good as a regulator of freights, serving to hold in check the greed of corporations which have created arteries of commerce more wonderful than those provided free by nature. In like manner the world to-day loses power of adequate expression upon contemplating the 15,000 miles of steamship navigation, and the 50,000 miles of steamboat navigation afforded by the Amazon and its tributaries. It might almost be said

that the Valley of the Amazon is cursed by the very greatness of its river. It has in fact *too much* navigable water ; a too intricately interlaced system of rivers and canals ; by which, on the one hand, men will continue too long to believe that nature has solved all her problems of transportation, and, on the other, when they do realize that this valley depends for its development upon railroads, these rivers and canals may prove in many cases a serious obstacle in the way of their construction.

The Amazon flows, during the major part of its course, through alluvial lands ; it is what we might call a " pratumial " river, like the Mississippi. Its tawny tide is subject, in large measure, to the same laws which govern the flow of the yellow floods of our great stream, except that the rotation of the earth, instead of acting perpendicular to its general direction, serves to retard its swiftness, and perhaps aids to keep open the infinite canoe paths and *igarapés* for which the Amazon is so famous. Here are the huge bends, shifting, shifting, as the current eats away the banks, until the narrow neck of land is breached, and a cut-off suddenly disturbs the equilibrium of the waters, and the local geography is forever changed. The channel, naturally, is fickle, so that the pilot never knows his way with certainty. Here too are vast areas below the level of the river, which are overflowed during the rainy season,—basins in fact, presenting characteristics identical with those so familiar to us in the great Tensas Basin of Louisiana.

The Amazon is not a huge Erie Canal, with unvarying banks and depth of water, but will require the services of the engineer, just as the Mississippi has done,

with the difference that there is three times as great a length of channel to be controlled ; and those familiar with the expense of river engineering will not be astonished at the statement that railroads could be built to develop the resources of the entire length of the Valley of the Amazon at less cost than that of maintaining the channels and riparian harbors of this greatest of rivers.

Humboldt indulged in dreams of teeming cities and active trade throughout this mighty water-threaded land ; even confused the world by painting the fascinating picture of open communication from the Caribbean Sea through the rivers Orinoco, Negro, Amazon, Tapajós, and Paraguay, to Buenos Aires. Lieutenant Herndon believed that with proper inducements to stimulate emigration, and above all with the immense impetus which would follow from the opening of the Amazon to the flags of all nations, Pará would in fifty years become the greatest city in the New World ; that Santarem would become St. Louis ; and Manáos, Cincinnati. That was forty years ago. The Brazilians, and many others, believed it. The nations of the earth were invited to the free use of the great waterway in 1867 ; parades, fireworks, balls, the dedication of monuments, attested the excess of Brazilian joy over the event. Foreigners were granted asylum and homes upon her soil. A quarter of a century has passed away, and Pará to-day numbers but 80,000 souls, and Manáos only 14,000 ! Three lines of ocean steamships ply to Manáos, a city blessed with a rock-bound harbor deep and spacious enough for a thousand ships to ride at anchor ; monthly steamboats ascend 2,400 miles to Iquitos

in Peru ; others go 500 miles beyond to Yurimaguas, almost within the shadow of the Andes ; others again journey to the foot of the cataracts on the Madeira, one of the greatest tributaries. The rivers Javary,* Purus, Iça, Juruá, Japurá, Tapajós, Xingú, Tocantins, are regularly visited by steamers—and yet the population of the Valley of the Amazon does not increase ! Ay, more, towns that once were thriving are now falling into decay ; the activity of the people is so far lessened that out of twenty articles produced for export in 1860, there are but six appearing on the bills of lading to-day, and of these all have decreased in quantity except Brazil nuts (castanhas) and rubber. The cocoa plantations are being overgrown with vines ; cotton, rice, and sugar are no longer raised† ; all have been abandoned for the gathering of rubber, and the wilderness is farther from being subdued than it was before.

A complication of causes has operated to produce this result. The Brazilian inherits from the Portuguese a genius for the initiation of great enterprises, and an inability to carry them to a fortunate consummation. He is apathetic, under the fatal spell of *dolce far niente*. The old Duke of Bragança, in 1580, suffered Philip II. to usurp Portugal, upon the promise of receiving Brazil as his portion. The promise was broken, and the Duke and the whole nation suffered it. That same submissive spirit lingers still. In 1889, two months after the Brazilians had been shouting *vivas* to the son-in-law of their Emperor, they cry other *vivas* to a republic which

* In this name, and others ending in y, the accent falls on that letter.

† Considerable sugar cane is still produced, but it is used entirely for the manufacture of rum, or cachaça, for home consumption.

had not yet proven itself more than a military dictatorship. They are an acquiescent people; preferring to adapt themselves to circumstances rather than seize the helm and shape their own destinies. A recent poetical conceit unwittingly has characterized this land and those who hold dominion over it, with singular aptness in the following stanza:

"Nobody's in a hurry there;
They are not permitted to worry there;
'Tis a wide, still place,
And not a face
Shows any symptom of flurry there."*

The demand for rubber opened up a new source of revenue. By going into the forests for a few months enough of the precious gum could be extracted to afford means for subsistence during the remainder of the year. It was easier than raising cotton, rice, and cocoa, so the plantations were neglected. The cocoa had at one time been the Brazilian's most promising crop, but even then he found it troublesome to cure it carefully, since attention to such little details was incompatible with long siestas in the mornings and afternoons, and he preferred the siestas in spite of the fact that his deteriorated cocoa sold for one-half the usual market price, obtained in other more thrifty parts of the world.

In addition to this is the network of political obstructions which chokes out all healthy development of the country. Few things are more fatal to national prosperity than to have government so administered that the individual is continually conscious of being governed. The merchant in Brazil comes in contact with an official in almost every transaction. He requires a

* Margaret Vandegrift, "Lazy Land," *Century Magazine*, Aug. 1890.

license before he can engage in any kind of business. Foreign commerce and home industry are hindered by excessive tariffs. It is a tariff for revenue only, so the Brazilian levies in both directions, upon imports and exports alike. He needs a permit to visit his own steamer in the harbor. He has to pay the customs officer to tally his cargo to avoid disastrous demurrage. Under such conditions, as might be expected, political corruption reaches a degree almost unparalleled,—even in the city of New York.

In Eastern Peru conditions are similar. The physical aspects of the country are nearly identical with those on the lower river. Similar customs prevail, and the officials are frequently even more arrogant and dictatorial, by reason of their remoteness from Lima, for where it takes four months for an exchange of correspondence the local official stands in little awe of the central government.

Trade is further stifled by the subtle poison of credit, whose baleful influence is felt throughout the length and breadth of the valley. It is a time-honored evil. Generations have grown up accustomed to it as we are to the mechanism of banking, with its relentless exaction of prompt redemption of commercial paper. The measure of wealth, then, becomes the amount of indebtedness, and the standards of commercial honor are reversed. In 1850, A. R. Wallace, the great naturalist, heard of an exceedingly *mean man* who lived at San Carlos on the Rio Negro. His reputation for depravity was so notorious that it had extended from town to town, a thousand miles away. When Wallace reached San Carlos he found that the moral obliquity of this contemptible

personage consisted in refusing to give or accept credit in his commercial transactions. Aside from this he had never been known to give offence.

It cannot be disputed that the settlement of the Valley of the Amazon has been retarded in an extreme degree by the reputation which it enjoys for insalubrity of climate, and thus has largely been defeated that advancement which navigation was hoped to produce. The establishment of nearly every enterprise has been attended with the sacrifice of human lives. A conservative estimate places the death rate among the foreign residents in Pará at over 25 per cent., and among the natives it varies between 12 per cent. and 15 per cent. Only one twelfth of the children born arrive at maturity. The poor little creatures are literally starved and chilled to death. The Indian subsists almost entirely upon bananas, and the coarser variety called plantains. He raises a little yuca, which is not bad ; he makes, or buys, some hard farinha, which he eats raw ; and he serves up at all times a wretched stew of the unpalatable *pirarucú*, a dried salt fish, the great dependence of hungry Amazonians, equivalent there to potatoes in Ireland, or seals in Greenland. All eat it, and digest it, or try to. When first caught it is a handsome fish, three to four feet long, brownish gray in color, dorsal and anal fins very long, and set far back so as to almost join the tail, which is rounded, and blotched with a deep red color ; but after being dried it looks like sole leather. Such is the diet unchanged from year to year. They use vegetables as if they were worth their weight in gold, although I have seen fifteen different varieties growing finely in various parts of the valley. It is not

The Great Amazon.

uncommon to see six green, or string beans served as a relish with meat for a dozen persons, and yet beans grow here to perfection ! Corn yields abundantly, and three crops can be raised on the same land in a year,—yet corn bread is an unknown luxury. The available foods are so many, so far in excess of those produced in temperate climes, that a northerner never ceases to marvel at the munificence of tropical nature, and still these wretched people try to subsist on plantains, farinha, and *pirarucu*,—try, but cannot do it. The craving of appetite leads to the eating of clay, upon which speedily follows dropsy and death. Sooner or later the system becomes anæmic for want of proper nourishment, and the patient falls a victim to bilious fever. It is marvellous that he has resisted disease so long. The hut is carefully embowered in a mass of trees ; no ray of sunlight ever strikes upon it. Inside there is a chill like that of a vault ; the earthen floor is so damp that the clay collects in balls under the heel, like moist snow, as you walk upon it. All the rubbish and garbage of the house is cast just outside the door, where it decays and exhales its poison. In open hammocks they sleep ; sometimes even on the ground, with only a thin palm leaf mat beneath them. No effort is ever made to protect one's self from the rain, but men and women come and go bareheaded, drenched to the skin, as complacent in the midst of the furious torrent as if it were the clearest June day that ever shone. In North America even our poorest workmen know enough to put on a rubber coat, or to "go in" when it rains, but on the Amazon they do not, and in the very land of rubber the rubber coat is a luxury

too costly to be dreamed of. Where customs such as these prevail can it bring us sadness to know that the Angel of Death casts her compassionate arms around the suffering children, or can we longer wonder that "fever" is a word oftener than any other on the tongues of those who dwell there? Indeed one is more disposed to wonder by what dispensation of grace *any* are able to defy so long the laws of health, and yet keep from the grave. In time, when thrifty men who fear not to labor, and thrifty housewives who believe in cleanly homes, have taken possession of this land, the fell name of "fever" will slip from the vocabulary, and be heard no oftener than in other lands.

I will not praise the climate; but I will call attention to the fact that in the Croton Valley of New York the prevalent malady is malaria and its malignant climax of bilious fever. Observe how these Croton farmers live. The house is nearly hidden from sight by trees; the earth is banked high around the foundation so as to prevent ventilation of the cellar, and keep the floors always damp; the windows and doors are all kept carefully closed, so as to retain a wholesome chill in the rooms; instead of planting a garden full of vegetables, instead of raising a flock of chickens and ducks, and making butter and cheese, and living, as they might, upon the fat of the land, they simply send milk to the New York market, with which to buy hams and pork, and so upon bread, and strong tea, and salt pork, they live, grow anæmic, wizen-faced, and suffer with malarial fevers—in one of the healthiest valleys in the world! It appears that effect follows cause in the United States as unerringly as in Brazil. Foreigners going to the

Amazon invariably find it troublesome to avoid the consequences of the negligence of their neighbors; they find moreover that they do not die immediately, and they speedily become reckless, and then quickly pay the fatal penalty. It is all needless, and whoever will avail himself of the experience of others in formulating a rational regimen of life in the tropics, may go there, and *live* there, with security.

Pará, it is, true, is afflicted with yellow fever, but it is worthy of note that previous to 1850 it was as famous for its unusual healthfulness as it now is notorious for pestilence. In those days the city depended upon surface drainage; disease is now fostered by the most defective sewerage system that the wickedness of incompetent engineering ever perpetrated.

It may now seem more comprehensible why the steamboats have not stirred the Amazon Valley into activity. There are characteristics which must be changed by a strong infusion of new blood before this country can be rehabilitated; and, moreover, it must be remembered that steamboats could not have accomplished it, even with a different people; that in no part of the world have they been known to do it; that they are but the pioneers of commerce, and cannot stimulate it to a broad and noble development. The towns on the Rio Paraguay are only a little better than when Dr. Francia was their autocrat; the Magdalena slumbers still amidst its palms; the Nile—we all know that the wise advisers of the Government counselled building a railroad to the Red Sea; and it was only after the Macedonian cry was answered by the moneyed princes of the Thames, and the iron horse brought her products to the

sea, that India became a steady producer, and began to prove her power as a mighty constant factor in the commerce of the world.

The history of the exploration of the Amazon is not a joyous one. Vicente Yañez Pinzon, one of the lieutenants under Columbus, entered the mouth of the river in 1516, and according to his report the natives called it "Marañon," and to this day that part of the Amazon which courses through Peru retains the ancient title in common usage. In 1538 the Amazon was rediscovered by Pedro de Vergara, far among the Andes, where now stands the town of Jaen,* who furthermore "conquered" the valley. Two years later (1540) Francisco de Orellana, with his fellow traitors, "discovered and conquered" the Amazon, sailing from the Rio Napo, where Pizarro was deserted, out to the sea, and around to Trinidad. No fabled adventures of the Middle Ages surpassed the realities of this wild and desperate voyage, and no words can express the horrors through which the remnant of Pizarro's forces retreated back to Quito. Blood flowed freely where Orellana made his way, and the Indians' first acquaintance with the white man was mingled with terror. Next came Pedro de Orsua, with his company of intriguing monsters, with Lope de Aguirre in particular, who killed Orsua and eighteen or twenty of his party, at various times, on the long and dreadful route. Pará was founded by

* In early times known as Igual Fongo and Pacamoras; corrupted later into Yagua-fongo and Bracamoras. Jaen was founded in 1549 by Diego Palomino. It belonged in the jurisdiction of Chaga Inga, of the province of Chuquimayo. Under the jurisdiction of this governor came also Santiago de las Montañas and Borja.

Caldeira* in 1615. At that time many Dutch and English ships were accustomed to visit the Amazon, and an English colony had been established on the Island of Tucuyús, which colony was promptly destroyed by the Portuguese.

A few soldiers having brought glowing reports of Eastern Peru, or Maynas, as they called it then, to the west coast, the province of "Maynas y el Marañon" was created, and Don Diego Baca de Vega was sent to the conquest of this country, "by the mercy of that conqueror" Don Francisco de Borja. It is curious to observe how inseparable are the words "discovery" and "conquest" in the old Spanish American histories. Accordingly a town was founded here just under the brow of the Andes, and called "San Francisco de Borja," in honor of the "merciful" conqueror.† But, as fortune would have it, Maynas did not at once enrich the royal treasury, and the land was left to the peaceful soldiers of the cross who came to the conquest of souls. The missionary labors in Maynas are of exceptional interest, but their history would form a tedious relation. Examples of noble self-sacrifice, and undaunted zeal in the midst of privations and dangers of a severity scarcely to be conceived in these days, have consecrated many a spot in that land with hallowed memories. The Portuguese, controlling the mouth of the great stream, aspired to possess it as far west as the Andes. Two new settle-

* Pedro Texeira was with him.

† Borja was founded in 1634. It is probable that the early missionaries, who were the actual settlers under authority from Don Diego Baca de Vega, complimented the viceroy, and sought for their little town the protection of the Saint of the same name by the title given.

ments of Irish* and English on the Island of Tucuyús were obliterated. In 1691 an expedition was sent up the river, ostensibly as a guard of honor with Padre Fritz, whose name has become so indissolubly connected with the great tribe of the Omaguas in Peru, but their efforts to usurp the country were frustrated by the Indians. Subsequent attempts were made, resulting only in further bloodshed, until at length all claims to East Peru were relinquished, and the Rio Javary was decided upon as the western limit of Brazil.

The Amazon was but slowly emancipated from the obscurities which fable imposed upon it. Padre de Acuña first chronicled some half definite geographical knowledge, gathered during his journey with Pedro Texeira from Quito to Pará in 1639.† Even at that early date it was known that it was possible to ascend into the high plateaus of Bolivia, and thence to reach the famous mines of Potosí, by the way of the Rio Madeira.‡ Acuña also tells us that one can pass from the Rio Negro into the Orinoco by a canal, and "descend to the North Sea, where are the Hollanders,"—Guiana.

At last the energy of a French scientist, La Condamine, gave the world some accurate information of this unknown region. This daring genius, having completed his astronomical labors, the measurement of a meridian at the equator, for which the French government had

*The Irish colony under James Purcell was destroyed by Pedro Texeira in 1629, and the English colony in 1630, by Jacome de Noronha.

† "A New Discovery of the Great River of the Amazons," by Padre de Cristoval de Acuña; trans. by Clements R. Markham, F. R. G. S.; published in the Proceedings of the Hakluyt Soc. Also an early English translation published in London by S. Buckley, in 1698, contains an interesting map of the Amazon.

‡ The Indian name for the Rio Madeira was Cayary.

sent him, with others, to Quito, determined to explore the Amazon. He crossed to Jaen, and then descended the river, shooting the great rapids of Manseriche, and, continuing to Pará, made invaluable observations, dispelling mists of ignorance, ascertaining the latitude and longitude of important towns and mouths of rivers, and bringing data for a map, more accurate, I am constrained to say, than many school geographies of to-day.

At the close of the eighteenth century came the mighty Humboldt, exploring the Andes and the upper Amazon, the Orinoco and the upper waters of the Negro, with their binding canal, the far famed Cassiquiare. Knowledge is fast dissipating the darkness now, and the dawn comes on with greater rapidity. Von Martius and Von Spix explored the Amazon, Negro, and Japurá, in 1819, spending three years in botanical studies, laying the foundation for that monumental work on the Flora of Brazil, the last volume of which has scarcely grown cold from the press. Within the same decade Alcide D'Orbigny began his marvellous investigations, letting in new rays of light. Professor Pöppig followed close upon his heels, and then the English sent Smyth and Lowe to ascertain "the practicability of a navigable communication with the Atlantic by the rivers Pachitea, Ucayli, and Amazon." The Prince Adelbert of Prussia, thirsting for adventure, explored for the first time the Rio Xingú in 1843. That indomitable traveller and accomplished scientist, Francis de Castelnau, in the same year began, by order of the French government, his mammoth journey from Rio de Janeiro across the continent and back again by way of the Ucayali and the Amazon to Pará, arriving in 1847, after four years of wan-

derings. At last the State Department of the United States, believing that "the geographical situation and the commercial position of the Amazon indicate the future importance to this country of the free navigation of that river," sent Lieuts. Wm. A. Herndon and Lardner Gibbon.* Herndon, with immense practical wisdom and clear judgment, executed his commission and submitted a report which stands to-day as the acknowledged classic on the resources of the Amazon. No book of travel has ever been written more free from errors or misconceptions than this of our distinguished countryman.

How well we have improved our opportunities may appear from the circumstance that when I arrived in Iquitos, Peru, I found the American \$5.00 gold piece worth 7 *soles*, while the English pound sterling was worth 9 *soles*!—the *sol* having an exchangeable value there of about 80 cents.—The reason for this is obvious; the Peruvian has commercial relations in which he can use the pound sterling, whereas he has *no* use for the American coin. We have never realized that this question of trade with South America is a personal matter, an issue between man and man! The English and Germans working on that principle have obtained the commerce which we might have had. All the laws that Congress may enact will not give us this trade until we study the South American and his wants, and cater to his tastes. I was asked recently if there were any psychological explanation of this peculiar case of

* Lieutenant Gibbon was detailed to explore the Bolivian tributaries of the Madeira, as well as the latter river, a labor performed with great fidelity, as subsequent explorations have proven.

stupidity in the American, who in so many ways leads the world. I think there is. We are the greatest nation of inventors on the face of the earth. We are used to an educational policy in business. Each man has some patented novelty, which is "the best and only proper thing." He labels it *Eureka*, and sets out to benefit humanity with it. No matter what *you* may think,—it is his mission to convict you of error, and sell you "your money's worth." This is one of our national characteristics, but it is not advantageous to the creation of foreign commerce among conservative people. We must learn to send what *they* actually want, not what we think they *ought* to want, and let them bear the consequences. After we have established the trade will be time enough to encourage the adoption of our improved appliances.

There have been other explorers ; Wallace, the naturalist, unlocking the last secrets of the Rio Negro ; Vallée, telling us the final truth about the Araguaya and Tocantins ; Agassiz, giving the history of the rocks and the fishes of the great valley ; Keller explaining the difficulties of the cataracts of the Rio Madeira ; Orton, elucidating the routes across the lofty Andes ; and finally Crevaux, the Stanley of South America, climbing the unknown Tumac Humac Mountains, and penetrating the great wilderness of North Brazil, where fable until recent days had placed the Lake Parima, and the white Indians who dwell in the glorious El Dorado.

It is at last possible to know the Amazon, but unfortunately it is a *terra incognita* to the bulk of our people. It is conceived of as a dismal, interminable swamp ; a vast, miasmatic basin, teeming with every species of

obnoxious insect, with a boa constrictor on every bough waiting to seize you in the forests, with an alligator alert to devour you on every sand-bar, and a hideous vampire hovering over every sleeper in the night, and yet, after so many decades of assiduous exploration, scientists are in doubt about the vampire ; adventures with reptiles are as exceptional there as they are in many parts of the United States ; and alligators are as abundant and as voracious in the lagoons of Florida, as in Brazil.

Neither have I found it a reeking, pestilential morass. It is a valley full of strange delights, which even come down to the sea to greet one at the very threshold. The land rises into sight from the horizon of the ocean in a series of blue-gray bluffs, crowned with palms. At their bases are long lines of gleaming sandy beaches, with the surf curling in white wreaths over them. The soft air comes laden with the perfumes of flowers, and the invigorating scent of spices. When fully within the river, an odor, like that of ripe bananas, rises from the waters. Along the south shore are plantation houses, very pretty with their long, rambling, irregular, red tiled roofs, set off by white and yellow walls among surrounding groves of palms. The other shore of the mighty stream cannot be seen, but everywhere appear fairy-like islands, their outlines subdued in the tender rosy haze of tropical light, until they seem almost as ethereal as the air itself. Such were the first glimpses. Later in the day a black cloud rolled up from the sea, deluging the earth with a shower so heavy as to obscure even the shore near which we sailed. Then it swept on up the bay, and as we rounded a point of land the sun came out on a freshly washed forest, and Pará, now just visible,

seemed lifted up into the air by the illusion of a mirage, where it hung like a city cut in cameo, with pearly towers and domes glistening against the background of a deep blue sky.

Pará is in many respects a handsome city, and with wise sanitary arrangements, and a stringent system of quarantine, it could not fail of becoming an attractive



RIVER FRONT, PARÁ.

spot for tourists. It contains much architectural beauty, and the private houses with their luxuriant gardens are especially charming. The glazed tile, in delicate tints of blue and pink, is commonly used as a facing for the walls of buildings of every sort. The principal streets are well paved and the frequent rains keep them perfectly clean. It has its slums, however, which are as

shocking for their filth, as the other quarters are surprising for their beauty and neatness. The first hackman whom I patronized was instructed to convey me to Nazareth Street. The distance was a little more than a mile, and my driver took me through all the back streets he could think of,—a cosmic peculiarity of the race, and doubtless practiced by the hackmen in the cities of Mars. I thus had an opportunity of peering into a great many very dirty hall-ways, and of seeing an equally dirty and very briefly clad population. After getting my lungs well filled with the foul vapors exhaling from the green festering filth of these miserable streets, we came, to my infinite relief, into the broad plaza where stands the grand theatre, a splendid, massive, but Frenchy building. Here, at least, one could breathe. On the east side were tile-faced houses, with gardens of richly colored plants casting a flush of warmth over the cold white walls. On the other sides of the square were shops and buildings of a nondescript character. Beyond was Nazareth opening its splendid avenue of mangoes, graceful clusters of palms rising here and there, overtopped by an occasional dome of the giant *sama-uma*. There is a richness, a depth of greenness, and a beauty in outline, in the clustered masses of tropical foliage, which becomes more clear and striking when associated with works of architecture. Sometimes nothing more than a plain yellow wall with a window, or a balcony, becomes the interpreter of the beauty of a palm tree, and suggests all the romance of this land of flowers, and fruit, and happy idleness. Passing from street to street, vistas of marvellous beauty continually open,—moss-grown yellow walls, and fantastic gateways; white col-

ummed houses amidst the dark green trees ; lovely gardens with fountains playing, with statues bending gracefully among the flowers ; with a rambling villa of exquisite design, massive and yet ethereal from the atmospheric tint of blue given by its glazed tile walls. The people are as picturesque as the city they live in. The Brazilian gentleman is always immaculate in his dress, and fond of colors. The negro population, which is very large, is still more addicted to display, and the brilliant hues of crimson, blue, and orange, gleam everywhere upon the streets. The tropical bird is truly of gorgeous plumage !

Pará occupies a position of great importance, being the port of the Amazon, controlling to-day the entire trade of the valley behind her. She is visited regularly by steamships of four different lines, one flying the Stars and Stripes, and by various tramp ships, and sailing vessels. Her exportations exceed \$20,000,000 *per annum*, and yet the city is not being adequately enriched. Her own people have been too deeply imbued with the aristocratic heresy of the indignity of labor to seize the magnificent opportunities which lay within their grasp. They preferred the professions, above all the profession of politics, and in consequence the great rubber trade of the Amazon is conducted by a few foreign houses. Brazil is outgrowing this. Her children feel less aversion to honest toil than formerly, but her complete emancipation will probably come through amalgamations with foreigners, when, instead of being the conservative race she has been in the past, she shall acquire the broader character of a composite people.

The result of the growth of the rubber trade has been

the extension of a vast steamboat system, reaching from Pará almost to the utmost limits of navigation in the Valley of the Amazon. Few indeed are the rivers on which the steam whistle has not been heard. One company alone has a fleet of over thirty boats, and there are several smaller lines. In addition to these are hundreds of private launches of from 10 to 100 tons burden, which visit the smaller tributaries in quest of rubber, so that there is scarcely a hamlet from the Atlantic to the Andes, which has not communication with the outer world by steamers of some description.

The lower Amazon has been so frequently described that further details may be a labor of supererogation. Suffice it to say that Pará is not on the Amazon; that it stands at the mouth of the Rio Capim, on an arm of the Rio Tocantins, a great disadvantage to it as a port, a circumstance pointed out as early as 1639, by Padre de Acuña; that you must first sail eastward to the sea of Marajó, and then westward 70 miles in the big estuary, and then northward through little narrow *furos* another 70 miles or more, before finally reaching the Amazon. This is a very beautiful sail. The estuary is like an enormous lake; on its shores are sleepy towns nestled within the forest; then come the picturesque *furos*, canals only 50 yards in width, where you can peer into sylvan secrets, where the giant trees almost overarch the steamer. In the Amazon you sail through a bewildering archipelago. There is the island of Tucuyús, where the English and Irish fell before the Portuguese; next comes the town of Gurupá, with its crumbling fort and other signs of former prosperity; beyond which is the level delta of the Rio Xingú. The entire country

is level in fact, without landscape; only a vast waterscape, with a fringe of forest, expanding, contracting, dotted with boats whose blue and red sails send long reflections of brilliant color trailing across these mighty reaches of river. On the north side is soon seen the mouth of the Rio Parú, recently explored by Crevaux. Here begins a low range of mountains, with level summits, breaking down into gaps of singular regularity of angle. The south shore still continues low and level. Farther on is Prainha, a town of diminishing importance; Montalegre next, clinging to the sides of high, steep hills. Mountains appear on the south side now, and the Amazon becomes very sensibly contracted. The Atlantic lowlands have been left behind, and at Santarem it is seen that we have passed the dividing range of mountains, and have entered the interior basin of the Amazon. Santarem,* a progressive town, stands on a high bluff overlooking the crystal waters of the Rio Tapajós, while behind it are ridges of mountains extending far into the southwest. This is only 400 miles from the ocean. Fifty miles farther is Obidós, the head of tide water, and the centre of a large cattle trade. Here are extensive grassy plains. The natives say that these extend far to the northward through that almost unknown belt of Brazilian Guyana. Certain it is this whole region north of the Amazon, as far west as the Rio Negro, is high land, and very different in character from the lower region on the south. The Rio Madeira comes in through a flat, swampy, unstable delta; the Negro is bifurcated at its mouth by a large

* There is a small colony of Americans, from the Southern States, settled at Santarem.

island, but its northward shore consists of high sandstone bluffs. It is within the mouth of this river, where it expands into a deep bay six miles in width, and upon these sandstone hills, that stands the city of Manáos.

The ocean is 1,000 miles away, but here within this inland harbor are steamships at anchor. Vessels of 28 feet draught can reach this point at all seasons of the year. It is the natural port for the products of the Rios Madeira and Negro, and of all the region west of them as far as the Andes. Establish telegraphic communication to this point with the outer world, and three-fourths of the present trade of Pará will be at once transferred to Manáos; give it a railroad to the coast of the Caribbean Sea, and it will become a second Buenos Aires. There is room upon these hills for a city of 2,000,000 inhabitants; it possesses natural drainage which will make its sewerage questions easy of solution; it already possesses a system of water-works having at command a large supply of pure water from the hills. There is a spirit which favors enterprise discoverable upon first contact with the citizens of Manáos. They believe in modern improvements; the water-works attest it; the gas installation now in progress; the big iron Yankee market building; the Yankee steel bridge; all demonstrate the public sentiment. They say the construction of these public works formed the basis of considerable political jobbery, which may perhaps be another sign of progress, on a par with the manipulations attending public works in some other corners of the globe! Furthermore, the Manaenses have subsidized steamship lines to bring them to their port; it has been hinted that they will encourage the

telegraph company that will give them the daily market reports from New York and London ; that they will remove the municipal and provincial taxes on whatever may be needful to start a lumbering industry in the adjacent forests ; that they will aid a cotton milling company that will utilize the water-fall now wasting its power in the suburbs of the city. These fourteen thousand Manaenses are keen for their commercial betterment, realizing that they must exert themselves to overcome the advantages of their rival, Pará. The city is embellished with two handsome churches, a big college and museum, and other prominent public buildings.

From the Rio Negro to Peru the Amazon is called the Solimões. The whole river changes character. The forests are stunted ; the foliage has a paler hue ; the Imba-uba, or cecropia, a fig-like tree, becomes more abundant along the river bank, its ashen trunks strongly suggesting the cotton woods of the Mississippi. In fact this part of the Amazon strongly resembles the Mississippi. Its waters have the same yellow color ; its shores are now high, and again sunken for great distances almost to the water's edge ; back of these are extensive basins, the home of the rubber tree. They are not marshes, but are heavily timbered basins, subject to inundation during the rainy season. Important basins of this kind are, the region of the Maués Indians, between the Rios Madeira and Tapajós ; that of the Manao Indians between the Rio Negro as far north as Barceloso, and the Solimões and Japurá on the south and west ; another between the Rios Purús, Coary, and Solimões ; one opposite Fonteboa between the Japurá and Solimões ; one opposite São

Paulo d'Oliveira between the Solimões and the Iça; and the whole region around the mouth of the Rio Javary. The interior also contains many of these basins. They are characterized by a network of channels which unite many of the great rivers one with another. They furthermore contain extensive lagoons, and occasional areas of open swamp, while many lesser basins are only penetrated by such a backwater as is called a *bayou* in Louisiana, and which in Brazil is distinguished as an *igarapé*. The titles for the various watercourses in the valley of the Amazon are very accurately distinctive. The *igarapé* is always a *bayou*; where a channel leaves a river and returns to it again it is called a *paraná*; when it unites one river with another it is a *furo*, or *canal*; while a *rio* is always a river except in a few cases where some estuaries and long *furos*, or *parands*, have been mistaken for independent streams. In the midst of these basins are many islands of higher ground, and it is upon these, when they front the rivers, that the towns are usually situated. Cudajós, the first important village west of the Negro, is built upon a clay ridge on the edge of the enormous Manao basin. Coary, Caiçará, Fonteboa, Tabatinga, and others are similarly placed. It is curious to observe that nearly the whole of the great interior basin, which contains these smaller basins, lies south of the Amazon. The river hugs the northern limit of this depressed area. It swings northward in Peru until the bluffs at Pebas deflect it southward; at Loreto it is again turned downwards to $4^{\circ} 30' S.$; it steadily travels toward the equator until it reaches $2^{\circ} 30' S.$, when it is once more bent back to $4^{\circ} 10' S.$, at Coary; it still determinedly resumes its northward jour-

ney, encountering the northern highlands, if so I may call them, at the Rio Negro, and following them closely until it finally gets clear of all hindrances at the mouth of the Rio Jary, from which point it pursues a due north-east course to that mouth called the Canal do Norte, in latitude one degree north. This characteristic of the river surely cannot be accidental. The Rio Negro shares the same peculiarity, keeping close to its high north-eastern bank instead of cutting a way through the soft alluvium of the Manao basin. It is furthermore worthy of note that wherever the trend of the Amazon is toward the north the tributaries from the south side empty into it through a considerable delta, while those from the north side do not. When the trend of the great stream is toward the south these conditions are reversed. If the engineer ever seriously studies the regimen of the Amazon with reference to the needs of navigation, he may have to ascertain here the rationale of one phenomenon at least which the investigations on the Mississippi have not taught him to comprehend. There are difficulties of navigation which distress the pilot in the Solimões. The channel is clear enough as far as Coary. This town, however, is difficult of access, being built within the mouth of the Rio Coary. Many towns along the Amazon are thus secluded, a measure of precaution, as some assert, against the obnoxious visits of former tyrannical rulers, but it is quite as likely that the greater abundance of the smaller fishes, and the greater security of the banks of the tributaries, had something to do with it. Another peculiarity of Coary is its very noticeable division into two parts as distinct as two separate villages. One worthy gentleman gravely

affirmed that this was the product of political hostility, one part being republican Coary, and the other conservative Coary. I could not tell whether his eye twinkled or not as he said it, but other cities might take a hint from it.

Above Coary the pilot's apprentice soon begins to throw the lead, for the channel is so fickle that it cannot be trusted from one voyage to another. Sharp bends become noticeable, and the quantity of floating wood increases. The boat's propeller is constantly striking them, and there is a continual danger of running upon a snag. Just below and above the mouth of the Rio Juruá the river is a series of tortuous twistings, where navigation tries the skill of the pilot severely. There are no permanent marks along the shore; there is not a buoy, nor a beacon light, throughout the length of the Amazon, not even below Pará, and yet Indians and half-breeds steer these steamers, by night as well as by day, in rain and in fog, the same man guiding the boat 2,400 miles from Pará to Iquitós, and a serious accident is unusual. It is one of the marvels of the Amazon, and even the natives grow eloquent in their praise of the Indian for his skill in this. West of the Rio Jutahy there are no important difficulties in navigation as far as Iquitos, and even beyond this as far as Nauta.

As the days drag on the monotony of the river becomes more oppressive. There is nothing but endless forest, and channels twisting in and out among innumerable islands. There is a sort of painful fascination about it. Out of the fantastic vine-draped woodlands one can build in imagination grottoes, castles, and gro-

tesque monsters, and, after hours of watching, as you come to the end of an island you feel as if a change must be impending, as if beyond this point of land, where the trees are growing scattered, and a broader expanse of water glistens through rifted ranks of foliage, beyond all this you feel that bays must widen, that cities must lift before your sight, and the journey there be finished. At times the banks rise high, exposing beds of yellowish-white indurated clay, exactly the color of a plastered wall. These precipitous banks, here and there broken down, and everywhere partially overgrown with vines, looked very picturesque, like some ancient walled town falling into ruins. Irregular hills of a hundred feet in height are also seen. Fonteboa, the most desolate town I ever beheld, is on high ground. Some fine old pale yellow adobe buildings are falling into decay here, and the few hundred inhabitants live in a long L-shaped row of small tile-roofed houses, packed as closely together as in New York streets, although there are millions of acres for them to expand into. São Paulo d'Oliveira is prettily situated on an extensive elevated ridge. Small settlements and plantations appear at intervals, only serving to impress one more strongly with the amount of misery which men will inflict upon themselves by their want of thrift and industry. In happy contrast to this wretchedness was the sight of two contiguous plantations, called Santa Rita, the home of an old German and his son-in-law. Many acres have been cleared and, instead of being half choked by weeds and brush, the fields are as clean and lovely as any northern farm. The houses are kept neatly white-washed, the blinds gleamed with a recent coat of green

paint, and the porch looked dry and comfortable. Ample gardens, flocks of poultry, herds of cattle and sheep, fields of corn, all suggested material comforts. What better argument is needed than the sight of these sweet cheerful homes to prove that persistent energy, here as elsewhere, will yield its reward. These men are doing well, with circumstances no different from those which produce poverty and squalor among their neighbors. Here are infinite thousands of acres to be had merely for the tilling. Nature has supplied all, and only needs to be trained by the hand of man to serve and feed him. Furthermore, nature seems to have set apart this region, this interior basin of the Amazon, as the world's great conservatory of rubber.* It grows wild, in the lowlands subject to annual overflow. The tree is dome-shaped, about fifty feet high, with grayish trunk and branches, and sparse foliage. The milk obtained from the inner bark is collected in little cups, much after the manner of taking maple sap. The milk is then poured over round sticks, or flat blades, and cured by being held in the smoke of certain burning palm nuts, as the nuts of the Inajá, and Urucury. Layer after layer of milk being added, the product is finally prepared for shipment in the form of large round or flat-sided balls. Four-fifths of the exports of the Amazon consist of rubber, which is to-day, and will continue for many decades to be the most important source of wealth to the valley, and if the demand for this wonderful gum increases in the future as phenomenally as it has done in the past, the planting of great rubber orchards will become imperative. Dependence upon the wild re-

* The *Hevea Brasiliensis*, and *H. discolor*; natural order Euphorbiaceæ.

sources is altogether too fortuitous ; the available crop must become a more manageable factor, and in this necessity imposed upon Brazil is found one of the most hopeful indications that, in spite of the fluctuations of stock markets, and the errors of some rash investors, no amount of resultant prejudice against South American ventures can prevent the development of this Valley of the Amazon !

In earlier days Tabatinga, the frontier town between Brazil and Peru, was thought to be destined to great future importance, as the old law compelled a transfer of cargo from the vessels of one nation to those of the other at this point. But when the great river was constituted an international highway, the exigencies of commerce quickly changed all this, and the massive buildings which had been erected at Tabatinga are already in ruins. Only a little army post, and a custom house, remain of its former glory. The Rio Javary, however, which embouches just below the town, has lately risen in importance since the discovery of large rubber forests along its margin. Ten years ago this river was little more than known by name ; now there are more than half a dozen towns along its banks, the steam whistle has startled the wilderness four hundred miles from its mouth, and its magnificent tributary, the Itacoahy* was last year ascended in a steam launch a distance of five hundred miles. The Javary is the boundary line between Brazil and Peru, and enjoys with the Amazon the advantage of being free to the

*Wrongly called Techuahy on the maps. This exploration was made by Mr. James Baird, of Manáos, who ascended the Itacoahy, and its great tributary, the Ituhy, in 1889.

flags of the world. The great steamboats that ply between Pará and Iquitos, always turn aside to serve the towns along this river, but as the commerce here increases it will unquestionably stimulate the establishment of a local line of steamers bringing the products of the Javary to Tabatinga for reshipment to Pará, which will resuscitate the fallen importance of this ancient town.

From Tabatinga to Iquitos is four hundred miles through the same low-lying forests, a mere repetition of the familiar scenery of the lower Amazon. On the way the mouths of a few rivers are passed, chief among which is the Rio Napo, the ancient route across the Andes, down which came Orellana, the first explorer of the valley. There are a few towns also, more notable in the history of Eastern Peru than for present consequence. Iquitos is a new city, the metropolis of the region. It has grown as a commercial necessity, owing to its geographical situation, being the most central point accessible by steamers of eight feet draught, for the trade of all the East Peruvian rivers. Its population numbers about 6,000, of whom 90 per cent. are half-breeds and Indians. There is a well-built Governor's Palace, containing the custom house and all the government offices. A considerable machine shop is also maintained under government patronage, but the 1,000-ton floating dock mentioned in the encyclopædias was long ago sunk by incompetent management, and the hospital was never finished. There is a municipal school, a church, and several quite pretentious private buildings, one of which is said to have cost \$100,000. The city owes its importance to the rubber trade, and contrary to the usual custom in Spanish American towns all æsthetical con-

siderations have been overridden by the commercial zeal of the trader, so that the place possesses little beauty. The streets are bare of trees, and very few are cultivated in the private gardens. Even the plaza which was contemplated by the earlier settlers has been sold for business purposes by the municipal authorities. The value of property here is a good index to the commercial activity of the city, lots of 300x500 feet being worth from \$100 to \$2,000 according to their location with reference to the water front. Judging from statistics Iquitos is at present less prosperous than she was five years ago, but the decline can hardly be permanent. The mammoth *caucho*, or *Castilloa* trees, which yield the bulk of the Peruvian rubber, have been destroyed in great numbers by the ruthless gatherers of the gum, reducing the exports in proportion, but rubber orchards will ere long be planted, restoring the trade of this region to even greater prosperity. Furthermore, this country cannot long fail to attract the emigrating hordes of Europe. Look along the river here! Two thousand miles of it in Peru alone; one thousand of it navigable by boats of five feet draught! Three hundred and fifty miles of deep water on the Rio Ucayali; one hundred on the Rio Huallaga; one hundred and thirty on the Rio Tigre; with many others of lesser size. A steamer already makes monthly trips from Iquitos to Yurimaguas, at the head of navigation on the Rio Huallaga. The land is gently rolling, but the tide of this great stream flows through these hills, as placid as the Hudson beneath its Palisades. There is no swamp to be seen, but on every side is the luxurious vegetation of the tropics. The Andes are not far away, and their

presence tempers the atmosphere. It is more bracing than the lower parts of the valley.

The Huallaga, as it rises, affords a climate to suit every constitution, from him who revels in the tropics, to him who loves the icy breath of the frigid zone. The settler may choose to be a grower of rubber, of rice, of sugar, in the lower land along the Amazon and Ucayali; he may choose to plant tobacco, rivalling Perique for



TROPICAL VEGETATION.

its rich aroma, cinchona, cotton, coffee, corn, in the higher land along the Huallaga and its tributaries, where the climate is a perpetual spring, where summer heat was never known, nor frost has nipped a single bud. Here are pretty little towns already started,—Tarapota, and Moyobamba, in the very heart of this favored region, the latter a well-built city of 8,000 souls; and beyond them are rich plateaus where wheat and barley, apples and all the northern fruits and garden vegetables

will gladden the hearts of wanderers from boreal climes. Of special importance is the cinchona tree, which is indigenous to these inter-Andean valleys, and which could and should be cultivated there with profit*; but which in its wild state has been destroyed by the reckless gatherers to such an extent that the plantations established by the English in Ceylon, and Jamaica, and by the Dutch in Java, supplied in 1889 sixteen millions of the seventeen millions of pounds of cinchona bark from which the world in that year obtained its quinine.

There is yet another portion of Eastern Peru, of splendid possibilities, full of beauties, regarding which the world has had only dim, uncertain testimony. This is that part of the Amazon from the mouth of the Rio Huallaga to the Andes, a distance of 200 miles, locally known as the Alto Marañon. This it was my privilege to ascend in canoes one year ago. In its lower part the whole environment is the same as that seen throughout the length of the Amazon. It is wonderful to think that at this point, San Lorenzo, 2,800 miles from the mouth of the river, the elevation does not exceed 750 feet above the sea. The only difference observable is the greater magnificence which the forests possess as viewed from the canoe, which creeps close along the bank at the feet of these woodland giants. The smooth trunks stand like polished columns of marble in an architecture grander than man has yet produced. Now their color is gray; now white; again tinged with a flush of red; or

* Since the above was written the price of cinchona bark has been decreasing, until it is stated that the East Indian plantations have ceased to be profitable, and many planters are even grubbing up their trees to make room for other crops. Under these circumstances it may be said that cinchona will never be grown to any extent in South America.

turned into rarest *verd antique*. To a height often of more than a hundred and fifty feet they tower in their splendid strength, without the deviation of a single line from arrow-like straightness, their symmetry unbroken by a single branch, until at that great altitude the limbs, like mighty arms, stretch forth, supporting domes of densely clustered foliage which overspread the smaller trees beneath. It is a piece of nature's glorious architecture, sublime in its simplicity and elegance of proportion, possessing that mysterious charm which is always the part of greatness. Around the bases of these mighty trees is a mass of vine and shrub, with palms springing in graceful curves out of the surrounding foliage, drooping back again as if loath to leave the earth, their supple leaflets ever trembling in the breeze. Such arabesques, such curves, no Moor has traced in Granadan palace, nor artist Angelo has wrought into groin or nave of his masterful temple. The shadows of the woodland are relieved with bloom of every hue. The orchids imprisoned in their forest towers, like some Lady of Shalott, are tangled in a maze of thread, which has flown adrift to weave festoons and lace-work in this confusion of tropical exuberance. At times the Indians who paddle our canoes give us a little excitement when they hear game on the shore, the grunting of wild hogs, the snapping of twigs as a tapir crashes through the brush, and entreaties are useless. The huntsman's instinct is too strong, and off they go, mad for the chase. Again, they see a beautiful umbrella-shaped paw-paw tree with its handsome cluster of golden fruit, and to the shore they go again, and with their habitual lavishness fell the tree to get the treasure.

In the first hundred miles of the Alto Marañon are occasional plantations—*chacras*, they call them—and the two little towns of San Antonio and Barranca. The river, mind you, is still a thousand feet in width, and steam launches now and then come up here after rubber. The plantations produce delicious bananas, excellent corn, many vegetables, and handsome cattle and sheep, but they are usually poorly managed. The huts of savage Indians are becoming common. Hitherto the natives have been mostly of that dejected and unfortunate class known as "Christianized." The savage strikes you as being nobler, showing the influence of freedom. The Indians of the Valley of the Amazon are not prepossessing in appearance. The short stature, the short thick nose, the heavy jaws, and the small facial angle, do not indicate high intelligence. The Tupi tribes of Brazil, the Iquitos, Omaguas, and Tucules of Peru, are in general of great docility, and have yielded meekly to the domination of the whites. But at Barranca and westward, I met a tribe called Ahuarunas, which departs in many characteristics from those around them. The first whom I saw were the chieftain and his wife. He was tall and heavy, and had a pleasant face, with well-chiselled features, the forehead high, the nose long and perfectly straight. His hair, in addition to hanging down his back, had been made into two little braids which hung like horns from his temples. His only garment was a brown striped waist-cloth. In manner he was as simple and *naïve* as a child. His wife, who followed along behind, stopping when he stopped, advancing when he moved, like a faithful dog, was a mere girl, of slight form and delicate features, with a small chin, and

an almost Grecian nose. Her arms and hands were of an absolutely perfect mould. Later in my journey I met others of the Ahuarunas, and these exceptional characteristics seemed to be a persistent quality of the tribe. I regretted that time would not permit me to remain longer among these Indians to learn something of their language, which I was told differed greatly from those of the neighboring tribes. The native dialects of the East Peruvian Indians are in general harsh and unpleasant, the words terminating with a sharp rising inflection, and the voice sustained even at the end of the sentence, giving it a peculiar unfinished sound. It is too late to study these dialects in their purity. Spanish words have become unconsciously incorporated into the Indian speech, sometimes a single word consisting of an Indian and a Spanish root combined.* Also the Spanish pronunciation has confused the tongue of the aborigine, distorting native names in the vain effort to represent their sounds through the phonetic value of the letters in the Spanish alphabet, as, for instance, in the common blue flowering herb which the Indians call "ocojoquay."† The English sound of "j" being absent from the Spanish language, the best the Spaniard can do is to call it "ocolloqui"!

From Barranca is obtained the first good view of the Andes, which are seen in an encircling arc of serrated mountain, curving from the South into the North. They are very beautiful; very deceptive, too. The blue peaks, when the cloud banks lift, stand out so clear against the sky, and tower to such a lofty height

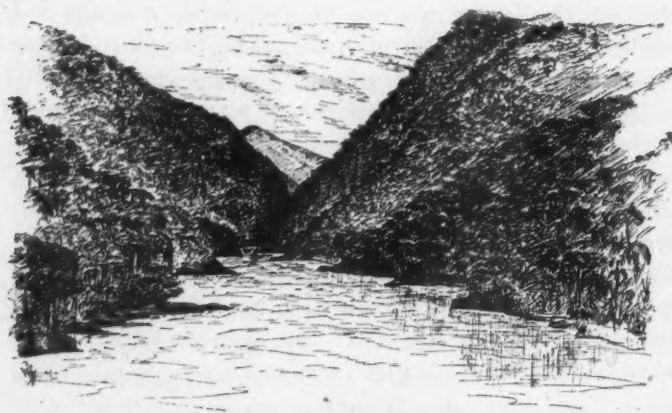
* As in Puca-casajo, or red gravel.

† Called Rincão in Brazil; used as a febrifuge.

above the wide expanse of gently undulating forest, that they seem close at hand, although they are fifty miles away. The peaks of Chayavitas and Cahuapanas, which rise behind Moyobamba, are especially conspicuous, with their precipitous flanks and pointed summits. A hundred miles the river threads this forest before reaching the bases of these blue mountains, but we realize their nearness in many ways. The air smacks of their tonic ozone, which dispels the sultriness so common on the lower reaches of the river. Shrubs and grasses belonging unquestionably to higher altitudes are noticeable, and serve to indicate the agricultural possibilities of the region. There are no plantations between Barranca and the mountains,—nothing but a vast wilderness, waiting to be subdued by man! The river winds among its hundred islands, ready to be the burden-carrier of a busy race. But now all is silent, deserted. It is a *cul-de-sac*. At the head of this lovely valley is a gorge, the Pongo de Manseriche, the limit of possible navigation on the Amazon. My own soundings show that a vessel drawing five feet of water can ascend to this point, 3,000 miles from the sea, with perfect ease. The only points where a vessel of deeper draught would be obstructed are the shallows of Semira, 16 miles east of Parinari, where it is never safe to count on a greater depth than seven and a half feet, and at Vapor Playa, in the huge bend immediately below the junction of the Rio Pastassa with the Amazon, where for about ten miles the river is extremely wide, but not more than six and a half feet in depth at low water.

At the Pongo de Manseriche the old story of La Condamine's adventure in shooting these rapids 150

years ago returns to mind. His name has become a classic association with this spot, but his description, full of that awe of nature which ever filled his soul, has been built upon by historians until few know what is truth and what is fable. The "sombre light" of his account, words richly expressive of the softened glow filling the narrow defile, has been enlarged in Peruvian story to a twilight darkness. The gorge in its narrowest part does not exceed 200 feet in width. Into this channel is



PONGO DE MANSERICHE.

contracted the river which immediately below expands to 500 feet, and yet there is no sign of those foaming waters, no spouting spray, no furious rush and roar, which are the common quality of cataracts. The flood glides swiftly down at a pace that wins the greater admiration because of its comparative silence. Now and again the waters heave and send huge waves rolling concentrically away, and for a few seconds there is a tumult, but soon it subsides again, and the tide flows

placidly on. This is very remarkable, considering the extreme crookedness of the passage. The ridges of the mountains jut out alternately from opposite sides, like a dove-tailed joint. At last comes the main ridge of the Cordillera. The walls face each other here, the crests rapidly declining toward the gorge, and dropping down finally in so sharp a descent that the effect is almost one of perpendicularity. But the angle is just sufficient to admit of a scanty growth of trees.* Here is the narrowest part of the Pongo; here is the "sombre," soft, subdued, and hazy light, which has been wrought into deeper twilight obscurity in the lucubrations of historians. A soft light indeed! At the points of the mountains the densely clustered foliage intensified the color to a fine dark blue. Back from the river, in the deep defiles between the ridges, the azure tints become more mellow, more dainty, with the diffused light of rays dispersed by millions of glossy leaves. Through the gorge could be seen still other ridges, sinking in the distance, and fading into the tender blue. There was a solemn majesty in the scene such that I was loath to leave. It was in keeping with the character of the Amazon. Even here among the mountains, it hollows out a passage so deep that its mighty current may sweep through almost unruffled.

The question has been agitated ever since the days of Humboldt of raising the Amazon at this point by a dam, or of building a canal around the rapids, in order to open up navigation to Jaen, nearly two hundred miles beyond. I do not know what reaches of navig-

*It is a peculiarity of the eastern Cordillera of the Andes, in this part of Peru at east, and as far south as Shapaja, that it is clothed with verdure to its summit.

able water may exist west of the Pongo, and the testimony of the Indians on such a question is of little value, for they will affirm that a steamer can ride wherever a canoe can pass. They tell of four other Pongos, or cataracts, between Manseriche and Jaen, which is of some importance to know, and I can say with perfect confidence that to construct a canal around the great Pongo is utterly chimerical. At the very least it would require the excavation of one cut 700 feet deep, and nearly a mile in length, and several smaller ones, aggregating several miles with an average depth of more than 300 feet. A dam would be equally impracticable, for the current at low water has a speed of not less than fifteen miles an hour, and the depth, estimated from the quantity of water flowing through, is over twenty feet.* The river furthermore, is subject to phenomenal variations in volume, rising or falling often as much as fifteen feet in a single night. The construction of a dam under such circumstances is not to be thought of. There is another problem, however, which must in time attract the attention of the world. If navigation must end at this point, the site, it will be remembered of ancient but now deserted Borja, the first, and for more than a hundred years the most important town in East Peru, then a railroad could be built, connecting on the central plateau of Ecuador with the line to Guayaquil, or pushed directly west to the Peruvian coast. The latter is the shortest route from navigable water in the Amazonian basin to the Pacific Ocean. Nature has cut the way through every range of the mighty Andes.

* Discharge just below the Pongo is approximately 4,000,000 cubic feet per minute, at medium low water.

Just beyond the Pongo the Rio Santiago flows down from the north into the Amazon. Its principal tributary, the Rio Paute, is soon encountered, which has carved a passage westward through the central Cordillera to the town of Cuenca, on the same plateau where Quito nestles among its guardian peaks; or, following the Amazon to the superb valley of Jaen, nature has again cut the way through Andean walls to the Peruvian port of Payta.* By such a line of railway these fertile valleys would be developed, and the products of this whole vast state of East Peru, or Loreto, would find the most direct and rapid route to New York City through the Nicaragua Canal, which the genius of America will soon have made an accomplished fact.

For a moment let us glance at this great valley with comprehensive vision. For three thousand miles, after bursting through the Andes, the Amazon wanders through a mighty forest, the largest in extent, the most varied in its flora, which exists upon the globe. Immediately beyond the mountains the great interior basin spreads out, growing wider and wider, until it reaches the Rio Madeira, where it is nearly 500 miles from north to south. This basin is traversed by other mighty tributaries of the Amazon, which are navigable to the edge of the Bolivian plateau on the south, and to the beginning of the higher ground in Ecuador, Colombia and Venezuela on the north. Then, just below the Madeira, at the Rio Tapajós, is the Errere range of hills, springing almost precipitously from the level plain, stretching

* It is stated that the piercing of a single ridge in the Western Cordillera by a tunnel of no great length would render the construction of a railway line comparatively easy.

southward to the southern confines of Brazil, dividing the interior basin from those broad Atlantic lowlands which an infinitude of rivers, *parands*, and estuaries, has broken up into the most bewildering archipelago known upon the earth. This great valley has led many a mind into fanciful dreams. Even that intellectual Titan, Alexander von Humboldt, lost practical judgment in the poetical conception of utilizing the waterways of South America, but the very facts he gives in his own narrative are enough to dispel the illusion. Read his graphic description of the two enormous cataracts on the Orinoco. Then read Wallace's account of the miles of rapids on the Rio Negro. What avails it then that these two rivers, on the plateau where they take their rise, are connected by the Rio Cassiquiare? To build canals around all these rapids would be worse than reviving the defunct Panamá Canal. Likewise, on the south, we find many rapids on the rivers, which render the use of the intermediary portions impracticable, except for mere local transportation. Not many years ago the Madeira and Mamoré Railway Company started to build a road 240 miles in length around the long series of falls on the Rio Madeira, to connect with the great navigable rivers of Bolivia, but for various reasons the enterprise succumbed. It was a strange plan, and would have probably done very little toward developing the Bolivian plateau of the Mojos Indians. Rail communication without telegraphic connection with the market centres of the world cannot yield advantages which will enable the ordinary resources of a country to redeem its cost. The same lack of knowledge regarding the wants of mankind, which we find indexed in the market reports,

is the fatal obstacle in the way of developing a country by means of navigation. The Valley of the Amazon is grander in size, it is in many ways more wonderful than the Valley of the Mississippi, but it is far less glorious ! It is the way of God to give good gifts unto his children, but the consecration of them, by which their full sublimity becomes realized, is in the spirit with which His children receive and use them.

As I passed through this land of marvels I beheld town after town mute and sleepy on their palm bound shores as if an everlasting sabbath calm had settled over them. Held as by some enchantment, this equatorial race slumbers in the joy of an unending siesta. The richest valley of the earth is their inheritance, but they rise not up to possess it ! But blame them not harshly. Centuries of conflict, centuries of isolation chosen in preference to a career of tumult in their national centres of civilization, have made these people content with the fortuitous happenings of the passing hour. The grip of grasping monarchies across the sea, until recent years, has further stifled budding enterprise. They have struggled against a thousand obstacles, while the millions of Europe have been filling the hospitable lands of temperate climes, ruled by descendants of those who demanded Magna Charta, and of those who proclaimed the Declaration of Independence. Now, however, they are awakening ! The world is reaching out to them, and they are responding with such grace as men can when the facts and circumstances they confront are new. They are neighbors of ours ; people of this New World. They pattern after us in their governments, and look to us to give them the hand of fellowship. The word of

an American will be taken there as equivalent to his bond, and they welcome our people with whole-hearted fervor. It is a region open to us for commercial conquest, and American shrewdness, coupled with some modicum of that financial intrepidity which has characterized the English in their dealings with South America, will give us a new outlet for the product of our labor, and dominion of warm fellowship in the hearts of thousands who shall found happy homes in that land of plenty, when American locomotives fly from the Caribbean to the interior basin of the Amazon, from Eastern Peru to the Pacific Ocean, and from the plains of the Mojos to Rio de Janeiro, and when that greatest of American inventions, the electric telegraph, lets in the light of the world upon the darkness of that mighty valley, converting those who dwell there from the inhabitants of a benighted land into enlightened brothers to us all.

MAMMOTH CAVE, KENTUCKY.

A Lecture delivered before the American Geographical Society.

BY

HORACE C. HOVEY, D. D., F. G. S. A., ETC.

Modern voyages and travels have been pushed with such vigor as to reach nearly every nook and corner of our planet. Yet these researches have been mainly superficial in the sense that they have been limited to the surface of the globe. You are now invited to visit a region below the surface; a sunless realm that has, however, its mountains, plains and valleys, its lakes, rivers and cascades, its unique and extensive fauna and flora, and that claims a degree of attention not yet accorded to it by scientific men. While something has been done by individual enterprise, and in connection with state surveys, it yet remains for our geologists and geographers, by a system of thorough exploration, to take possession of under-ground America. It is estimated that the subterranean windings underlying the Ohio valley alone would, if put end to end, make a passage-way of 100,000 miles—a tunnel long enough to go four times around the globe. The region thus honey-combed in the single State of Kentucky exceeds 8,000 square miles. There are said to be 500 open caverns in Edmondson County, of which Mammoth Cave, now to be particularly described, is but a noble specimen.

The region shows few traces of dynamic disturbance, but its rocks have been carved in every conceivable manner by the chemical and mechanical action of water. Jutting crags at the head of ravines form what are known as "rock houses," or "rock castles," and that are highly picturesque, but seldom have any great depth. These ravines are usually dry in summer, though flooded in winter. The general absence of running streams has caused this portion of Kentucky to be called "The Barrens." The torrents formed in the rainy season cut their way through the strata down to the drainage level, and re-appear as perennial springs, often feeding rivers of considerable size. Green River is such a stream. It drains Mammoth Cave, as well as many other caves. Its waters never freeze, even in the coldest weather; and being navigable for a considerable part of its course, it furnishes a winter harbor for steamboats and other craft, when the Ohio River, into which it empties, is either ice-bound or clogged by drifting ice from the northern valleys.

One who strolls along the margin of Green River, will observe at intervals arches, or it may be mere rude gashes, in the bluffs. Now and then these openings can be entered, though usually they cannot be explored very far. Could this be done we should find a succession of tiers, or galleries, by which we might make our way, from stage to stage, amid surprising and magnificent rooms, until at length, we should emerge into an oval valley, around which may lie a cultivated field, or more probably a tangled thicket. These are sink-holes, natural traps, into whose jaws, in modern times, hogs and cattle have disappeared; just as in an-

cient times elk, bear and bison were entombed. Sink-holes near habitations have usually been stopped up, thus being transformed into ponds. The enthusiastic cave-hunter enjoys being let down by a rope through a sink-hole, if practicable, and then wandering on lamp in hand, through wonderful apartments where no human foot ever trod before. But the more safe mode of entrance usually is at a point where the cavern roof has broken through, the fragments forming stepping stones.

Mammoth Cave is in latitude $37^{\circ} 14' N.$, and longitude $86^{\circ} 12' W.$ It is midway between Louisville and Nashville, and may be reached by railroad. The environs are wild and rocky, abounding in game. Hence the legend is credible that the great cave was discovered by a hunter, named Hutchins, who in 1809, followed a wounded bear into its grim fastnesses. The cars now land us near the Mammoth Cave hotel, which is itself an architectural curiosity. The original cabin, as built in 1812, still stands intact, except that its logs are weather-boarded, and its masonry is hidden by masses of ivy. The log cabins were increased in number, as visitors multiplied, and to meet their demands a main edifice has been built with offices, parlors, ballroom, etc., which has been nearly doubled in size during the past year; while the cabins themselves stand as at first, except that they are connected by a long and delightful veranda. On entering the office we meet with a hearty welcome from Manager Ganter, and register our names with thousands of others who have come hither from all parts of the known world. The majority however are from the Southern States, and he who wishes

to see the best types of Southern society will be gratified here.

Loitering amid the long colonnade, by whose tall, white pillars the breeze floats in from a grove of aged oaks and across a blue-grass lawn, we find the very atmosphere redolent of romantic associations. How many thousands of tourists and savants have met here to gratify their curiosity concerning one of the wonders of the world. Guide-books can be had at the office, together with a map of the cave, both prepared by the author of this lecture for the convenience of visitors, and which, though far from perfect, give some idea of the intricacy of the subterranean windings. The areal diameter cannot exceed ten miles ; but the labyrinthine mazes are supposed by the best authorities to exceed 150 miles in all. The ordinary tourist seldom sees more than a comparatively small portion of this vast realm. Two principal routes have been marked out : the Short Route, covering about seven miles of underground travel, and requiring about four hours ; and the Long Route, taking nine hours and covering perhaps sixteen miles. Special trips are also arranged for those who wish to take them. My object in this lecture will be to conduct the audience over these regular trips, with perhaps an occasional digression. The regulation hours for entering the cave are 10 A. M. and 7 P. M. Moderate fees are charged, three dollars for the Long Route, two for the Short Route, and one each for the Special Routes.

Guides are autocrats here, and our safety depends on our obedience to their directions. Stephen and Matt, favorites with an entire generation of cave hunters,

rest from their labors. Their places are filled by William, Nicholas, Eddie, and others, black, white and mixed, who stand ready to enlighten us by scraps of wisdom and flashes of wit original and selected.*

Accoutred as we please we saunter down the forest glen and across a rustic bridge, to a rocky platform some 300 yards from the hotel, and 194 feet above the level of Green River. A geological section shows that the Chester sandstone forms the crest of the bluff, under which are strata of Saint Louis limestone, that have been excavated to the depth of 328 feet, though the horizontal tunnelling has extended for a great many miles.

The mercury may have marked 100° in the shade when we began our walk; but at the cave's mouth it falls to 66°. Lift your hand and you will find the fervid heat again. The cold current may be felt for a long distance before it commingles with the ordinary atmosphere. But when, as is the case in winter, the exterior temperature is lower than the interior, the current is reversed. The cave seems thus to breathe in and out, as if the mighty lungs of the earth were inhaling and exhaling the vital air—a phenomenon that caused the

*This lecture, as delivered, was profusely illustrated, and I regret that the pictures cannot be reproduced here. Mention, however, should be made of my artists, Mr. J. Barton Smith took the sketches used in my guide-book and magazine articles. The pioneer of subterranean photography was Mr. Charles Waldack, of Cincinnati. Since his day, Messrs. Thumb, Sesser, Farini, Darnall, and especially Ben Hains, have done work to be proud of when the intrinsic difficulties of their task are considered. I may add that my materials for the lecture itself were obtained during repeated trips through Kentucky, and have to some extent been already treated by me in descriptive narrations that may have fallen under the reader's eye. But in using them for the present occasion they have been carefully revised and corrected by recent observations, and important additions have also been made, now published for the first time.

H.

Greeks to give the name of Antron to such openings, meaning a breathing-place.

Mammoth Cave has a noble vestibule! Amid tulip trees and grape-vines, maples and butternuts, fringing ferns and green mosses is the gateway which the fingers of a rippling rill made ages ago by prying the rocks apart. The rill still runs and leaps fifty feet to the rocks below. As we descend the seventy steps of solid stone, winding around the cascade, we find that the air grows cooler still, till it has fallen to 54° Fahr., which is the uniform temperature winter and summer, year after year. This fact I determined after taking one hundred and fifty temperature observations in different rooms, pits and avenues, with the best instruments to be had from the Kew and Winchester observatories. In determining the temperature of the vast apartments of such a cavern we have doubtless ascertained the mean temperature of the crust of the earth, at least for that latitude. This conclusion has been since confirmed by repeated observations in other caves and grottoes of the Western States.

Having traversed a roomy ante-chamber we pause at an iron gate put there to prevent spoliation, illegal surveys and the intrusion of non-paying visitors. The guide unlocks the gate, and we take our last look at the dim daylight that struggles in between the bars. As the breeze we had noticed at first dies away, we light our lamps, feeling that it would be a serious matter to be lost in so vast a domain of darkness.

Old Jack, the house-dog, used to think so, too, and would accompany visitors no further than the gate, where he would peer into the mysterious darkness, and

then plod along home. But Jack had a companion in his old age, a frisky young puppy that knew no fear and never had a solemn thought. The latter would boldly follow us to the remotest bounds of the cavern. On one occasion he went with Professor Brewer and myself to the regions beyond the rivers, where he got lost. We set a lamp for him at Echo River and returned to the hotel. The next morning on going in we found him sitting by the lamp patiently waiting for us. But no sooner had we ferried him over than he ran away again. He was missing till the second morning, when on opening the cave the guides found the two dogs on opposite sides of the iron bars exchanging experiences. We traced the path that had been taken by the runaway, led by instinct where no human being would have dared to go alone and in the darkness of perpetual midnight. That dog had floundered through mud-banks, swum rivers, threaded intricate passages, always taking the short-cut, with no other guide than his mysterious gift of orientation—the same sense that pilots homing pigeons on their aerial voyages. By contrast with this perfect and fearless operation of instinct, the story may be told of old Matt's escape under similar circumstances. The colored guide named was at work near the pits when he heard some young fellows approaching with song and shout, as if slightly inebriated. The ex-slave thought that "discretion was the better part of valor," and hid in a crevice, put his lamp out, and quietly waited for the revellers to pass by. On coming forth from his hiding-place he found that he had no matches. The hour was late and he determined to grope his way out. Suddenly his staff dropped into a pit of unknown

depth. The brave guide swooned on the edge of the chasm. On coming to, he collected his wits and felt for the path with his hand, finally making his way to the surface. But it was an adventure that he could never tell of without a shudder.

Whatever route one takes will lead for some distance through the main cave—the great trunk from which all avenues diverge. As we proceed we are surprised to find ourselves following a well-worn cart road that presently enters a spacious rotunda. On our right are three huge vats, and a tall frame near by that once supported a large pump, but is now utilized for holding our superfluous wraps. These are relics of the old saltpetre works that have historic interest. The pioneers who followed in the wake of Daniel Boone were thrown on their own resources in all respects. The importation of gunpowder was attended with expense and difficulty. Hence, they sent out such strolling chemists as happened to be among them, to hunt for nitrebeds. One of these, Dr. Samuel Brown, of Lexington, Ky., made a journey of a thousand miles on horseback, in 1806, in order to inform the American Philosophical Society that the caves of Kentucky were rich in saltpetre. The statement made by this ardent patriot was remembered when the War of 1812 was waged with Great Britain. Other sources then being cut off, the Government, throughout that sanguinary conflict, was dependent on the miners of the Ohio Valley for the means of making gunpowder wherewith to repel the invaders.

The process of manufacture was as follows: The nitrous earth was carted out from various avenues in

hoppers where cold water, conveyed by wooden pipes, was poured over each charge, whence, in a day or two, a strong solution of the salts would run into the vats already mentioned. From the vats the liquor was pumped into a second set of pipes so tilted as to let it flow out of the cave, to be boiled and afterwards cooled in crystalization troughs. When ready for transportation, the crystals were carried on pack-mules across the mountains to the sea-board and put to a practical use. The business was carried on by the firm of Gratz and Wilkins, whose agent, Mr. Archibald Miller, declared that this one cave alone could supply the whole world with saltpetre. The contract for 1814 netted the managers \$20,000. When the war ended the demand fell off, so that the manufacture was stopped and has not since been resumed. We get an idea of what was done by the mountains of lixiviated earth cast up on both sides of the old cart-road, and that is now almost as hard as stone.

The stalls are still exhibited where the oxen were tied and fed, their halters being made fast by means of cavities called "pigeon-holes," and that were worn smooth by frequent use. The old ruts are remarkably preserved, as well as the prints of the ox-hoofs made more than eighty years ago. Those miners led rough lives, but did thorough work, upturning every stone where they thought there might be any "petre-dirt," as they called the nitrous earth. And when the Sabbath came they kept it as a day of rest, and were accustomed to gather in the rock chapel, bearing the name of the Methodist Church, where the logs are in place that served them as benches. Now and then a sermon is preached from this ancient and historical natural pulpit.

A trustworthy legend is connected with the family of Mr. Gratz, an early owner of the cave. He was of Hebrew stock, and had a charming daughter, Rebecca, with whom Washington Irving had a pleasant acquaintance. On a visit to Sir Walter Scott, Mr. Irving told the "Wizard of the North" about her; and thus, as we are assured, the pretty Kentucky Jewess, Rebecca Gratz, became the model of the renowned Rebecca of *Ivanhoe*.

Another legend is to the effect that when Audubon, the ornithologist, visited Rafinesque, in his Kentucky cabin, he caught a remarkable bat by knocking it down with the eccentric Frenchman's violin. Rafinesque had his revenge by naming the series of rooms where myriads of bats hybernate, Audubon Avenue. It used to be called Bat Avenue. At its entrance two skeletons were exhumed by the miners, one of a child, and the other of a giant. This fact seems to be well substantiated.

No one can tell what surprises may be sprung upon a cave-man. There is a place near the end of Audubon Avenue, in the so-called Little Bat Room, where a narrow crevice opens into a pit. The miners had an idea that it must be very rich in nitrous earth. One of them in making an examination dropped his lamp down this crevice. He climbed down a little way into the ugly black hole and felt for his lamp with a stick. The stick itself, however, slipped from his grasp and went rattling down into an abyss. The lamp was a simple affair. But as it could not be replaced without a journey of nearly 200 miles, its loss was a serious matter. Accordingly a sprightly young negro was let down by a rope, as a sort

of animated plummet to gauge the depth of the pit. He failed to recover the lamp ; but he described such a magnificent underground temple that the report was current for a generation that the lad had lost his wits. Thirty years later Matt, the guide, made his way from another direction into what is now called the Egyptian Temple, and there came across both lamp and staff lying near its splendid columns. There are six of these in all, averaging eighty feet in height and twenty-five feet in diameter. They stand in a semi-circle flanked by pyramidal towers. The material is gray oolite, fluted by deep furrows, and veneered with yellow stalagmite, rich as jasper, and covered by tracery as elaborate as Chinese carving. The floor slopes down from the vicinity of the pillars, while the roof gradually ascends until at a point perhaps 400 feet away, the distance between the dome above and the gulf below exceeds 200 feet ; and there a waterfall tumbles from an invisible source to the black pool that receives it into its bosom. And thus the little darkey, whose name even is unknown, found what was as marvellous as aught revealed by Aladdin's wonderful lamp, but found none to credit his fantastic tale.

Resuming now our exploration of the Main Cave, from which we have digressed, we find new objects commanding our attention as we advance. During a moment's pause we seem to hear the ticking of a musical clock. It is but the dripping of water in a hidden recess, measuring time as it doubtless has been doing for a thousand years. Near by is Wandering Willie's Spring, named for a blind boy who went wandering over the country with his violin. He wanted, as he said, "to see the cave for himself." Of course he lost his way ; and

when found by his companions, he was quietly sleeping by the limpid basin that has carried his name ever since.

Singular effects are produced by the devices of the guides. At a certain spot we are requested to stand still and extinguish our lamps for a few moments, while one of the guides burns magnesium at a point back of us. The result is a splendid view of the Grand Arch, and also of a remarkable shadow profile cast by the projecting buttresses. We are assured that it is an exact likeness of Martha Washington ; and there really is some resemblance to that "first lady of the land." When the lamps are re-lighted, we are also shown gigantic silhouettes made on the ceiling by incrustations of the black oxide of manganese. A whole menagerie is on exhibition, including a side-show of a giant and giantess playfully tossing papooses to and fro. We first ridicule these grotesque fancies, and then are fascinated by them. By the way, the etymology of the word "grotesque" is interesting ; it means, like what we find in grottoes, just as "picturesque" means, like what we see in pictures.

It is well to observe with care the large rock on the right that resembles a mighty sarcophagus. The Giant's Coffin is one of the most important land-marks in the cave. It equals in size one of the famous blocks of Baalbek, being forty feet long, twenty wide and eight or more deep. Often as I have passed it, whether alone or with a hundred companions, it has ever been with a feeling as if I had intruded into some sacred mausoleum.

At a point a hundred yards beyond the Giant's Coffin, the trend of the Main Cave turns upon itself at an acute angle on the left, and sweeps around in a magnifi-

cent amphitheatre on the right. A rude monument is here erected in memory of the gallant McPherson. More than 300 such piles have been reared in different parts of the cave, each tourist who chooses adding a stone. An incidental advantage of the custom is that it has helped to clear the paths.

The roofless remains of two stone cottages are next visited, as having a melancholy history. These and ten frame ones, now torn down, were built in 1843, for the use of fifteen consumptive patients, who took up their abode here, induced to do so by the uniformity of the temperature, and the oxygenated atmosphere, which has all the purity, without the rarity, of the air found in high altitudes. The second stone house was used as a dining-room; but all the rest were lodging-rooms and were well furnished and comfortable. Nine stood in this vicinity; but the remaining three were in other parts of the cave. This interesting experiment was thoroughly tried, but proved to be an utter failure; as did also the pitiful attempts of the poor invalids to make trees and shrubbery grow around their dismal huts.

A strangely beautiful transformation scene is exhibited in the Star Chamber, a hall several hundred feet long, about seventy feet wide, narrowing upward to a ceiling sixty feet above our heads. The gray walls are in contrast with the lofty black ceiling coated with the black oxide of manganese; and this again is studded with thousands of white spots, caused by the efflorescence of the sulphate of magnesia. The guide, in order to show off the chamber, seats us on log benches by the wall, takes all our lamps and vanishes behind a jutting rock; whence, by adroit manipulations, he

throws shadows flitting like clouds athwart the starry vault. The illusion is complete. The roof seems to have been lifted to an immense distance, and an imaginative person can easily be persuaded that he is actually gazing from a deep cañon up to the starry sky.

With an abrupt leave-taking the guide plunges into a gorge and we are left in utter darkness, and in silence so absolute that one can hear his own heart beat. While we question each other as to the meaning of this, we see in the distance a faint glimmer, like the first streak of dawn. It tinges the tips of the rocks, like the tops of hills far away. The horizon is bathed in a rosy glow, and we are prepared to see the sun rise, when the guide appears, swinging his cluster of lamps, and asking how we like the performance. Loudly encored, he repeats it—starlight, moonlight, thunder-clouds, midnight and day-dawn, the latter heralded by cock-crowing, the barking of dogs, lowing of cattle, and other barn-yard sounds, in which the ventriloquial guide is an adept.

Few visitors go further than this in the Main Cave, although it is well worth exploring to the very end. We pass along under a mottled ceiling that changes from a starry to a mackerel sky. We find many curious objects. There are snow-drifts of native Epsom salts whitening dusky ledges. There are ancient fire-places covered by broad slabs of limestone. There are numerous halls, mostly being enlargements of the general passage-way. Proctor's Arcade, Kinney's Arena, Wright's Rotunda, the Black Chambers, Solitary Chambers, the Cataracts, the Fairy Grotto, are all worthy of description. But we pass them by in order

to devote a little more space to what Bayard Taylor pronounced the grandest cavern room in the world. It is singularly designated as the Chief City. Taylor's estimate of its dimensions was "800 feet long, 300 feet broad, 125 feet high, and covering between four and five acres." It has just been accurately measured, and is 450 feet long, 130 wide, and covers one and one-third acres. But even this is an immense area, clothed as it is by eternal night, built in by walls of massive rock, and overarched by so vast a dome as to make us hold our breath, lest if silence were broken it would fall. Examination shows the arch to be one solid, seamless block of limestone that has doubtless been as it is now for thousands of years. Yet the ponderous rocks hurled about in the wildest confusion prove that mighty forces were once at play. All is quiet now, and the dust of ages rests on those huge blocks. Amid the interstices are bits of cane, such as the red men once used to fill with bear's fat and burn as torches, to light up their solemn councils, or to aid them in their search for hidden treasures of flint and alabaster. Bonfires used to be made of these cane-torches, which now have been really all destroyed or carried away. In lieu of them we burn red-fire and discharge rockets, which find room to explode before striking the distant walls. The dome seems to follow us as we retire, overarching us at every step, as we slowly withdraw from this pre-historic council-chamber of sagamores and dusky braves. The Main Cave has an average width of sixty feet throughout its entire length, and its height is rarely less than forty feet. No creeping nor crawling has to be done, although there is rough clambering at times.

Let us now return to the vicinity of the Saltpetre Works and explore the Gothic Avenue. At its junction with the Main Cave there is a noble amphitheatre with a narrow gallery sweeping across, and a rocky platform from which Edwin Booth once rendered selections from the play of Hamlet. Climbing a stairway we gain the highest cavern level, where everything is as dry as possible. Here, in a niche in the left hand wall, was long kept on exhibition the dried body of an aboriginal princess found by miners in a small cave in the vicinity. There were also a few genuine Mammoth Cave mummies, that were minutely described by Messrs. Gratz and Wilkins. These remains had not been embalmed, but were merely desiccated and kept from decay by the antiseptic properties of the nitrous earth.

In Register Hall guests are invited to leave their cards with the assurance that they will remain for years without mould or discoloration ; a statement to be taken with some allowance. There are in this part of the arcade various stalagmites and stalactites to which fanciful names have been given, such as the pillars of Cæsar, Pompey and Hercules, the Post Oak, the Elephant's Head, and the Old Arm Chair, in which it is said that Jenny Lind once sat and sang one of her sweet songs. Aside from the grotesque appearance of these gnarled and twisted columns, their most interesting feature is their extreme dryness. In one or two places I observed a few trickling drops ; but for the most part they were as dry as could possibly be. Hence they furnish no criterion whatever as to the age of the cavern. From certain other data it is concluded that Mammoth Cave and Niagara Falls were twins, both dating back to the Ter-

tiary Age. Water worn rocks are pointed out that show conclusively that an underground stream once swept through these halls, now so arid. But that must have been long ago. For the dust is often ankle deep, and when tossed into the air falls back like shot. So utterly free from moisture is it that not a particle of it will cling to the trailing robe nor stain the polished boot. Consequently the air is both chemically and optically pure, except as it may be made otherwise by our torches and fire-works.

Vulcan's Shop, the Lover's Leap, Lake Purity, Elbow Crevice, and Napoleon's Dome, are among the objects pointed out to us as we proceed to the end of this interesting avenue. On old maps of the cave a certain room used to be called the Haunted Chamber, on account of an adventure that befell one of the miners, a raw hand, who had trudged in here alone to dig his lot of "petre-dirt." He filled his sacks and started back, but lost his way, and to make matters worse stumbled over a stone and put his lamp out. Missing him at night-fall, his comrades hunted him up. When he saw them approaching, swinging their torches aloft and shouting, his excited imagination and his guilty conscience transformed them into so many devils, and he took to his heels crying lustily for mercy. It was with difficulty that the frightened wretch was brought back to his senses, and convinced that he was yet alive and in Mammoth Cave instead of in a worse place.

A more agreeable legend is linked with the Gothic Chapel and its charming Bridal Altar, where a Kentucky belle was wedded to a gallant young Southron, after having promised her mother not to marry any man on

the face of the earth. When taxed with having broken her vow she insisted that she had kept it to the very letter, and that it was not marrying any man on the face of the earth to be joined to her own true love in this subterranean Gretna Green.

The region of pits and domes is usually included in the Short Route, but for the sake of giving a more clear idea of the cavern in its continuity, we shall defer our description of it until, after an interval of rest at the hotel, we undertake the more extended trip to the farthest end of the cave.

Meanwhile, by way of an interesting digression, let us visit a locality half a mile from the hotel, and that has long been known as the White Cave, but which is probably only an arm of the Mammoth Cave. The entrance when first discovered was so narrow as to make ingress difficult; but it has since been enlarged and is guarded by an iron gate. The first chamber has a rough and muddy floor, a low, flat and uneven roof, and is in shape an irregular oval. The second is considerably higher. Its floor is intersected by a number of crooked channels in which rills are constantly running, so transparent as to be almost invisible. There are many stalactites hanging from the ceiling, varying in size from a quill to a saw log. Among the finest specimens of dripstone are the Frozen Cascade, and a stately column named for the Baron von Humboldt. In a third and far larger chamber huge masses have fallen, encumbering the floor and making it certain that the passage-way has thus been blocked to rooms beyond. Around these ruins a wide canopy of alabaster has been drawn. The idea has long prevailed, which is un-

doubtedly correct, that a hidden avenue leads to the vicinity of the Crevice Pit in Mammoth Cave. Various attempts have accordingly been made to break through the mighty curtain in order to find the passage sought. Such a discovery would on many accounts be desirable, as it would enable tourists who enter one way to go out another, and also make accessible an exceedingly interesting suite of rooms.

A fact of great importance to palæontologists came to my knowledge during the preparation of this lecture, not new indeed, but that seems to have been forgotten even by scientists. Some seventy years ago, Mr. Clifford, a Kentuckian, exhumed from the floor of the White Cave a number of huge fossil bones that, after passing through several hands, finally came into the possession of the Academy of Natural Sciences at Philadelphia. Some of these bones were identified by Dr. Harlan as those of the bison, stag and bear; while others, in an excellent state of preservation, belonged to a young *Megalonyx*, of a different species from the one found by Thomas Jefferson in a cave in the Greenbrier valley in Virginia. Along with these bones of animals were found fragments of a human skeleton, though not necessarily of the same era. Indeed the remains of the bear alone seem to have been contemporaneous with those of the *Megalonyx*. Dr. Harlan's conclusion was that the latter was about as large as an ordinary ox, and had attained three-fourths its mature growth.

Resuming now our exploration of the Mammoth Cave, we prepare for the Long Route. As it requires an all-day tramp, servants accompany us with baskets of provisions in order to spread a lunch at a convenient

place beyond the rivers. Extra oil-flasks are also carried by the guides to replenish the lamps when necessary. Down we go again into the cave's dark mouth, under the thick horizontal plates of gray limestone, from whose green, mossy ledge falls the wild, pattering rill; and then advance for perhaps a mile amid some of the scenes already described.

On reaching the Giant's Coffin we leave the Main Cave by creeping through a crevice behind that huge monolith, and enter the Deserted Chambers. To our left, as we advance, is the opening to a long and serpentine avenue; or succession of avenues, that have been connected by the untiring energy and skill of Mr. H. C. Ganter, and made accessible to visitors. It has branches leading to huge domes and pits, a resounding waterfall and charming "floral" regions; but its chief interest lies in the fact that by this passage visitors may now reach safely portions of the cavern that were formerly unapproachable whenever the rivers were flooded, as they generally are in winter. This is really the most important and costly improvement made here for a long time, and in honor of the manager by whom this difficult engineering feat has been accomplished, it has been agreed to name the entire combination of passage-ways "Ganter's Avenue," which is certainly more attractive than the old name of "Black Snake" or the unmeaning one of "Welcome Avenue," both of which are to be henceforth discontinued.

Preferring the more frequented path, however, we turn to our right, instead of to the left, descend a steep stairway, and pause for a moment beside Richardson's Spring, visited by the Indians long before it was dis-

covered by white men. About 150 yards beyond the limpid spring yawns a chasm called from the peculiar shape of a projecting rock, the Side-Saddle Pit ; above which is Minerva's Dome. Descending by a sloping path to a lower level, fifty yards beyond, we enter the Labyrinth, where we presently find ourselves peering through a window-like aperture into profound darkness. The guide thrusts blazing rolls of oil-soaked paper through a similar window, thus disclosing indescribable wonders to our gaze. This is the famous Gorin's Dome. Its total depth is said to be 117 feet to its lowest point, while the height of the vault overhead seems to be fully 100 feet, making 217 feet the total altitude of this mighty chasm. The perpendicular walls are draped with stalagmitic curtains whose folds seem to be loosely floating but are really of solid stone. These hangings, dight with figures rare and fantastic, were woven in Nature's loom by crystal threads of running water. Putnam's and Hovey's cabinets are smaller domes, where concretions known as cave pearls are found. The Labyrinth ends in Ariadne's Grotto.

Retracing our way we next visit the profound abyss styled the Bottomless Pit, above which expands Shelby's Dome. It is a double pit, being nearly divided by a tongue of rock that juts into it for 27 feet or more, from whose point Stephen, the guide, in 1837, threw a ladder across and for the first time explored the regions beyond. A substantial bridge now spans the abyss. By line and plummet the depth is only 95 feet on one side and 105 on the other. Shelby's Dome overhead may be 65 feet, and the space between about 15 feet, making 180 feet the entire distance from top to bottom of the great chasm.

The treacherous Covered Pit had been known for ears, but no visitor ever crossed it until I did so, following William the guide. Once fairly beyond the loose slabs between which the black depths seemed to be lying in wait for the heedless explorer, we were on *terra incognita*. Creeping cautiously along, we presently discovered twin pits with a ridge but six feet wide between. These I named Scylla and Charybdis. Climbing down for a few feet into Scylla we found a ledge from which we lowered a lamp into the deepest part of the pit, getting a good view of the wrinkled and corrugated sides. At length the lamp caught on a projection—or more probably, as I now think, reached the bottom—and the cord was burned off, and what remained measured 135 feet. Mr. Ben Hains recently measured the Covered Pit, and found it to be but 47 feet deep. Pit No. 2 is 80 feet, and Pit No. 3 is 30 feet deep, with an aperture to a lower pit 59 feet deep, making 89 feet in all. Mr. Hains found Charybdis to be but 79 feet deep. Beyond the latter is the farther edge of the Bottomless Pit, opposite the crossing by bridge. While making my measurements a large fragment of limestone, dislodged by the guide, rolled past me and went thundering into one of the pits.

Returning as we came, we next pursued a narrow crevice that led us to a point near the bottom of the Bottomless Pit, whence we saw volumes of smoke emitted through an opening from Charybdis. This led me to suspect that all the pits thus singularly clustered together are really united with each other. The truth of this conjecture has since been confirmed by Mr. Hains' explorations. This gentleman entered an open-

ing from the room called "Great Relief," and following a serpentine passage for half a mile finally emerged into Charybdis. He found, as I had surmised, that seven or eight pits unite at the bottom to form a magnificent hall, that varies in width from 10 to 50 feet, and in height from 35 to 135 feet. The floor is very uneven, rising in high and pointed hills between the pits above. This new and vast apartment we have named, "Harrison's Hall," in honor of the President of the United States. The figures on following pages will aid to an understanding of its peculiarities.

Beyond the region of pits and domes, Mammoth Cave forks into two passages. That tending to the right is Pensico Avenue, a mile long, and exquisitely arched. It contains among its objects of interest a grotesque resemblance to a sea turtle, a large white column called, for some unknown reason, the Pine Apple Bush, the Hanging Grove, Wild Hall, Snowball Arch, Matt's Arcade, Angelica's Grot, and a remarkable place styled the Grand Crossing, where four avenues meet. Pensico Avenue runs back toward Green River, in a direction parallel to the Main Cave, suggesting a possible outlet.

Returning to the Reveller's Hall, we follow a low passage, four feet high, that ends in the Scotchman's Trap, a circular opening overhung by a ponderous slab that seems as if a careless breath might make it fall. A canny Scot came in thus far and refused to proceed lest he should be buried alive. Hence the name. But we dive under and go on. Next comes the Fat Man's Misery, a long, winding way that originally must have drained the region of pits, with walls 18 inches apart, the average height being but five feet, and that changes its direction

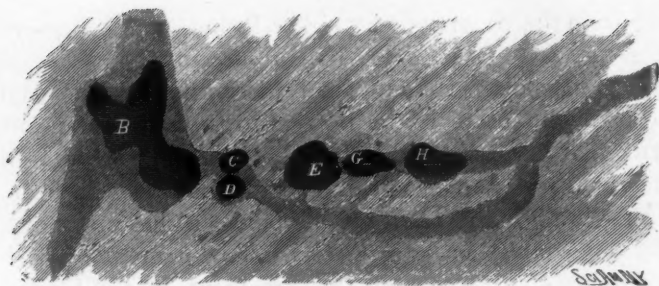


FIG. 1.

eight times in 236 feet. The sides are beautifully marked by waves and ripples, and polished by the friction applied by thousands of visitors. We straighten our spines in a room well named Great Relief, and then anxiously ask if there is any other way out than that twisted pass. The guide replies that we can go out by the Corkscrew, which, as we find on our return trial, is an intricate web of fissures conducting us up through a chaotic region, where we crawl through crevices and leap from rock to rock, for what would perhaps be a vertical distance of 150 feet, aided here and there by ladders, thus greatly shortening the trip. Those who come in one way generally go out the other, and regard the last way chosen the worst, whichever it may have been.

The Odd-Fellows' Links, Bacon Chamber, and a few other localities receive attention, and then the guide introduces us at once to River Hall, where are to be seen the most wonderful subterranean waters ever yet discovered. Only the faintest idea can be given of the gloomy wildness of this region. Our path first skirts the edge of cliffs sixty feet high and a hundred feet long, below which lie the sullen waters of the Dead Sea, whose



FIG. 2.

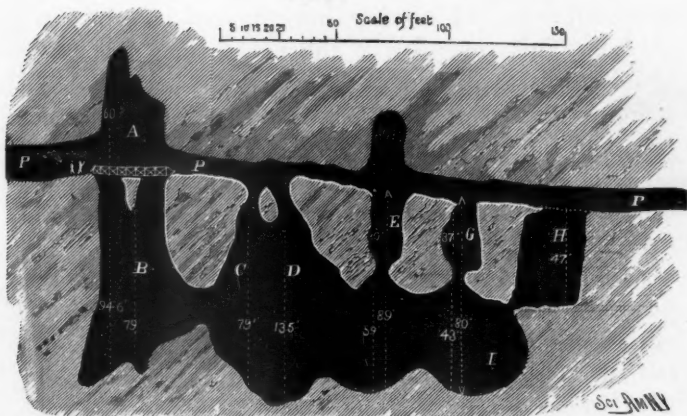


FIG. 3.

Explanation to cuts. Figure 1, Upper Orifices of the Pits. Figure 2, shows the horizontal Plan of the Hall. Figure 3, gives a Vertical Section. *A*, Shelby's Dome; *B*, Bottomless Pit; *C*, Charybdis; *D*, Scylla; *E*, Pit No. 3; *G*, Pit No. 2; *H*, Covered Pit; *I*, Sandstone Debris; *K* Lower Entrance to the Hall; *P*, General Pathway.

flavor is not saline, like its oriental namesake, but quite palatable. Descending a flight of steps, we proceed to the river Styx, diverging for a moment to see a cascade falling into a funnel-shaped hollow. It was in this vicinity that I found, in 1881, a natural mushroom bed, which led to some extensive experiments at subterranean mushroom farming.

The Styx used to have its ferry and its modern Cerberus; but now a natural bridge has been discovered, by means of which we cross over to the shores of Lake Lethe. Each of these bodies of water is about 400 feet long and 40 feet wide. A narrow path runs along the margin of Lake Lethe, at the foot of cliffs 90 feet high, to a bridge at the neck of the lake. Our path next follows a winding and rippling stream, which sometimes flows out from and at others into the dark lake just mentioned. This reversion of the current has never been satisfactorily explained.

Four varieties of blind fish have thus far been discovered. None of them are very large, the average size being about two inches in length. The largest thus far caught was six inches long, and was bought of the guide for ten dollars by a snob, who proudly had the costly fish served for his breakfast the next morning! These tiny fish are colorless, have cartilage instead of bones, are viviparous, and are so sensitive that if a grain of sand should fall on the water, they will dart away with rapidity. Blind crawfish are also found here, whitish, semi-transparent, with remarkably long antennæ and more delicate in every way than those found in outside streams. These also are highly sensitive and not easily captured. The total list of cavern fauna is not very great, after ex-

cluding animals known to be accidental visitors. Making allowance for synonyms, we find no more than one hundred species in all. Yet insignificant as they seem to the careless eye, they have received abundant attention from scientific men, and names big enough for whales and mastodons, instead of crickets, spiders, flies, fleas, worms and minnows.

The food supply of cave animals is scanty. Most of them are scavengers, subsisting on decaying wood, dead leaves, etc., swept in by the waters, or on relics left by human visitors. Cave spiders spin webs to catch cave flies, as is done in the upper air. Blind fish live on blind crawfish, when they can catch them, and these in turn extract smaller crustacea with their claws from under the flat stones where they hide. Aquatic plants here are not green, like their open water congeners, but are pellucid and bleached. Indeed the law is universal that all true cave fauna and flora are either without color or nearly white. There is a striking similarity between the deep-sea animals and those found in caves. The whole subject is profoundly interesting from its lessons as to the retardation and development of life ; but those wishing to pursue this line further are referred to the publications of Telkamp, Dekay, Packard, Cope, Putnam, S. I. Smith, and others.

There are several other subterranean streams besides those already mentioned. But we shall only describe our exploration of the famous Echo River. This is a body of water varying in width from 20 to 200 feet, and estimated to be three-quarters of a mile in length. Its depth, at ordinary stages of the water, is from 10 to 40 feet, and the roof rises above the surface to a corre-

sponding height. A flotilla of uncouth little flat-boats is kept on the river, some at one end and the remainder at the other, the materials for which were all brought in through the Fat Man's Misery, being afterwards put together. It is a fine spectacle to see eight or ten boats, each carrying from ten to twenty passengers, with an ample supply of lamps, and an occasional discharge of fireworks, following each other, their crews meanwhile tempting the marvellous echoes by shout, scream and song; laughter, whispers and yells; rattling pistol shots, flute solos and bright arpeggios on the cornet—all of which are faithfully reproduced, though occasionally with remarkable variations. The long vault has also a certain key-note of its own which, when firmly struck, excites harmonics of incredible depth and sweetness:

Last summer, in company with a party of four, no others being on the river at the time, we tried the effect of rocking the boat as violently as we dared to do, also striking the edge and the surface of the water with our paddles, and in other ways making as much agitation of the body of the stream as possible, and then awaiting the result in silence. I timed the concert thus created, and found its duration to be exactly half-an-hour! First came sounds like the tinkling of silver bells. Then larger and heavier bells took up the melody as the waves sought out the cavities in the walls. Then it was as if all chimes of all cathedrals had conspired to raise a tempest of sweet sounds. For a moment there was utter silence, soon broken by low mutterings, ghostly whispers, sudden shrieks, as if of men in agony. Then silence again. We were about to speak, when the guide motioned to us to remain quiet. When, lo! as from

some deep recess, hitherto forgotten, came a tone tender and profound ; after which, like gentle memories, all the mellow and mysterious sounds that had gone before were re-awakened until river hall rang again with the wondrous harmony.

A rocky inlet receives our craft as we land at Cascade Hall. We tread a pathway of solid stone leading through Silliman's Avenue. We climb cliffs, or dive under hanging rocks, or step aside to explore an attractive arcade, or a snow-drift of fibrous gypsum, as the case may be. We note the successive tiers, or galleries, showing how the cavern floor, from age to age, has dropped down to its present level.

El Ghor, which is but a continuation of the same avenue, contains many interesting objects, conveying valuable lessons in mineralogy and geology. Rhoda's Arcade, on our left, leads to Lucy's Dome, which I regard as the most symmetrical and lofty dome in the cave. Corinna's Dome rests directly over El Ghor, while Stella's Dome is reached by a narrow crevice further on. El Ghor is said to lead to a stream known as the Mystic River, though I have not yet verified this statement. Visitors usually leave the gorge at a small basin called Hebe's Spring, by climbing a ladder one at a time and going through a hole in the roof, to an upper tier, where they find themselves in a stony vineyard. Nodules and globules simulate clusters on clusters of luscious grapes, burdening hundreds of boughs, and gleaming with party-colored tints through the dripping dew.

Washington Hall is but a smoke-stained lunch-room, strewn with relics of hundreds, and possibly thousands of dining-parties, while along its walls are fragments of

bottles, rusty tin cans, and other reliquiae of underground feasts. While we dine, the guides fill the lamps from oil-cans kept here for the purpose. The ceiling of the Snow-ball room is dotted with hemispherical masses of snowy gypsum. Marion Avenue has two branches, one leading to Zoe's Grotto, and the other to Paradise, Portia's Parterre and Digby's Dome. These are highly interesting localities, but are not on the regular route, which, as we follow it, takes us next to that very treasure-house of alabaster brilliants, named for the mineralogist, Cleveland's cabinet.

Imagine a series of arches of 50 feet span, where there is a mimicry of every flower from the modest violet to the flaunting helianthus. Examine any one of these cave flowers—the "oulopholites" of the mineralogist. From a central stem gracefully curl countless crystals, fibrous and pellucid; each crystal a study; each fascicle of curved prisms wonderful; and the whole blossom a miracle of beauty. Multiply this mimic flower from one to a hundred, a thousand, a myriad. Move down the dazzling vista, as if in a dream of Elysium—not for a few yards, or rods only, but for one or two miles! All is virgin white, except here and there a patch of gray limestone, or a spot bronzed by some metallic stain, or as we purposely vary the lovely monotony by burning colored lights. Midway is a great floral cross overhead. Clusters, wreaths, garlands embellish nearly every foot of the ceiling and walls. The very soil sparkles with trodden jewels. I picked up one of these gems, and had it magnified five-hundred times and then photographed, merely to show how absolutely perfect it is. The fancy finds every flower of the green-house or parterre in this crys-

talline conservatory. Sprays of asters, drooping fuchsias, spikes of tuberoses, wax-leaved magnolias, blanched tulips—but why try to exhaust the botanical catalogue? They are all here, and patient search will find them, every one.

Charlotte's Grotto is the crowning glory of this fairy-like region. I had often heard it extolled, but never having seen it in any of my trips, I made particular inquiry. No one seemed to know anything about it. Finally, on hearing a comely colored matron at the hotel addressed as "Aunt Charlotte," I sought information from her concerning the locality bearing her name. She told me that the grotto was named for her by Stephen Bishop, her former husband. Her nephew piloted me to the spot, where I found all the wonders that had been so graphically described by Professor Locke, Bayard Taylor and other early visitors. There the pendulous fringes of the night-blooming cereus are rivalled by snowy plumes floating from rifts forever safe from the withering glare of daylight; and thanks to the convenient forgetfulness of the guides these marvels have been thus far kept from spoliation by thieving curiosity-hunters.

Beyond the fairyland the cave divides into three branches. That on the right leads to the Sandstone Dome. The middle branch is Franklin Avenue. We followed the left-hand path, over the Rocky Mountains (100 feet high) and on to Croghan's Hall, the end of the Long Route. Here is also the Maelstrom, a pit said to be 175 feet deep. Into this abyss Mr. W. C. Prentice descended by a rope, some years ago, and met with various thrilling adventures that have been done into verse by Rev. George Lansing Taylor. It is related of Dr. John

Croghan, for whom the above-mentioned hall is named, that during his foreign travels he was continually inquired of about Mammoth Cave; and when obliged to confess that, although a Kentuckian, he had never seen the greatest wonder of his State, it so mortified him that, on returning home, he paid the cavern an immediate visit. Shortly afterwards he bought it, and devoted much time and money to the development of the property. At his death he left it to his nephews and nieces, by whom it is still owned, though under the exclusive management of their agent, Mr. H. C. Ganter.

In this condensed description but a few of the many rooms and avenues catalogued have been even mentioned. Prof. D. D. Owen says that 225 halls and passages have been explored and named, and that the chemical and mechanical action of water have here displaced twelve million cubic yards of limestone!

Visitors usually rest for a while on the rustic seats near the entrance before climbing the hill to the hotel. Here the inner and outer atmospheres mingle. By contrast with the pure, oxygenated air of the cave, the odors of the outside world, of the trees, grass, weeds and flowers, is strangely intensified, and for many delicate natures overpowering. The guides tell us that, in accomplishing the long and short routes we have journeyed more than twenty miles under ground. They assured me that in my tramping in and out on repeated visits, I had travelled more than 200 miles. None of us feel like disputing such assertions. We are satisfied—satiated. Though gaining less definite knowledge than might be desired, we have had a surfeit of adventures, conjectures, guesses and mysteries. Feelings akin to friendship have

sprung up within us, however, for grand old Mammoth Cave. And it is with positive regret that we finally turn away for the last time from the fern-fringed chasm lying there in the soft moonlight, where the sparkling cascade throws pearly drops from the mossy ridge, and spreads its mist like a silver veil.

GEOGRAPHICAL NOTES.

THE NORTH POLAR REGION.—Capt. Diego J. Ferraro, of Mexico, has put forth a pamphlet in English, affirming that the regions of the North Pole were habitable in the primeval times of our planet, and have again become habitable, “perhaps forever.” If it were “rigorously necessary” to prove his assertion, Captain Ferraro would extract the proofs from his unpublished work, entitled: “The Forces in Nature, or the Laws of Equilibrium and Motion in the Universe.” Under the circumstances he does well not to make the extract, for the work contains a “Titanic principle,” which he had the good fortune to discover in an unforeseen manner, and this principle furnishes a solid basis to the learned reflections of the late Captain Symes, better known as Symmes, who bored a hole through the earth from pole to pole. On this basis rests also the North Polar Paradise, where the Regeneration of the World is to begin, and this paradise is to be reached by a railway in Greenland. This railway is to be constructed by the United States, or by the combined efforts of all civilized countries, or,—and this is the efastest way,—by a company, which Captain Ferraro will organize under a concession, to be granted by the United States.

America has her Symmes, and England her “Parallax” Hampden, and Mexico,—the greatest is behind,—her Ferraro:

The force of Nature could no further go;
To make a third she joined the other two.

UNITED STATES BOARD ON GEOGRAPHIC NAMES:
BULLETIN NO. 1.—This Bulletin, which is dated December 31, 1890, gives the decisions of the Board with regard to 226 names. The principles observed are good, though somewhat rigid; and one, the familiar "Leave well enough alone," has been omitted. Most of the decisions recommend themselves, but it is no improvement to adopt *St. Croix*, which is neither French, nor English, nor Danish, in place of *Santa Cruz*, the name bestowed by Columbus. The true name of the Spanish island is *Puerto Rico*, but *Porto Rico* has acquired rights in English; and *Congo* will not give way to the arbitrary form *Kongo*.

These changes are matters of opinion, but nothing can be said for the decision in the case of *Sausalito*, described by the Board as "A post office in Cala., U. S." The post office is in a village on San Francisco Bay, five or six miles to the N. W. of San Francisco, and there known as *Saucelito*, a form which preserves, at least, the etymology of the real name, *Sauzalito*, the diminutive of the Spanish word *Sauzal*, "a ground planted with willows." There are persons in California who write *Sausalito*, but they spell Cincinnati with an S; and the Official Register of the United States, which lends its support to the Board on Geographic Names, cares for none of these things. A Spanish dictionary is the right authority.

The difficulty of the task assumed by the Board grows greater the more it is considered. The field of revision and correction is literally as wide as the world, and it may be affirmed that the work will never come to an end. Even in the most highly civilized countries

the human proneness to error has produced strange results in nomenclature. The writings of Col. de Rochas on the Provençal names furnish many examples of mistakes, which have established themselves in French books and maps and records, to the confusion of sense and etymology. In most cases the similarity of sound has suggested a supposed French equivalent for the Provençal word. In the valley of Bardonesche, the village of *Milaures* (a thousand winds) masquerades as *Mylords*; the *Champ de la Lioure*, (the Field of the Hare) in the commune of Le Sapey, is known as the *Chandelier*; the sandy tract of *L'Arénié* is turned into *L'Araignée* (the spider); and the *Jas de Ghigo* (herding place) near Bausset, in the Department of Var, is transformed into the *Jus de Gigot* (leg-of-mutton gravy).

The conclusion is that names must be studied and treated with respect.

THE NAME "AMERICA."—Dr. G. Hellmann contributes to the *Verhandlungen* of the Berlin *Gesellschaft für Erdkunde*, Band XVII, No. 8 und 9, a report on the Eighth International Congress of Americanists, which held its sittings in Paris during the week of the 14-20 October, 1890. Dr. Hellmann was one of the Vice-Presidents of the Congress, and occupied the chair during the first day's session.

The first question brought up was that of the origin of the name "America," and the theory concerning it advanced by Mr. Jules Marcou, "a Frenchman residing in New York."* According to Mr. Marcou, Vespucci, whose true name was *Alberico*, changed this in 1503 or

*This is an error. Mr. Marcou lives at Cambridge, Mass.

1504 into *Amerigo*, after he had become acquainted with the existence of the Amerrique Mountains in Central America. This is proved, for Mr. Marcou, by the fact that no such form as *Amerigo* is to be found in the Italian Saints-calendar.*

The Italian scholar Govi (now deceased), writing in 1888, says Dr. Hellmann, corrected Mr. Marcou's assertion concerning the impossibility of identifying the names *Alberico* and *Amerigo*. They are, in Florentine usage, one and the same name. A letter of Vespucci's, written before the year 1500 and now in the Gonzaga archives at Mantua, is signed *Amerigo Vespucci*; and Don M. Jimenez de la Espada, who spoke on the subject, mentioned that the name signed by Vespucci, in the letters and other documents preserved in the Archives of the Indies, at Seville, is sometimes *Alberico* and sometimes *Amerigo*.

An additional refutation of Mr. Marcou's theory was furnished by Dr. Hamy, who laid before the Congress the fac-simile of a Mappamundi, the work of Vallesca, of Majorca, dated in 1490, and with a written memorandum on its back that it had been bought by the merchant, *Amerigo Vespucci*, for 120 gold ducats. The original map had a curious history. It was for a time in the possession of George Sand; and eventually, though happily not till after the copy had been made, it was very seriously damaged by the upsetting of ink upon it.

*Prof. Luigi Hugues remarks on this point: "I acknowledge with Mr. Marcou that the name *Amerigo* does not exist in the list of Saints as a prænomen; but neither is the name *Alberico* to be found there. There does exist, however, in the Roman Martyrology a Saint *Emerico*, a king of Hungary, who died in 1030, and is commemorated by the Church on the 4 of November; and this name passes easily into *Americo*." *Bollettino della Società Geografica Italiana*, Anno xxii, Vol. xxv, p. 522.

Mr. Pector, the Chief Secretary, called attention to the statement made some years ago by the President (Cárdenas) of Nicaragua that the Central American mountain chain described by Mr. Marcou was called, not the *Amerrique*, but the *Amerrique* chain. "Here," says Dr. Hellmann, "I felt it to be my duty, after listening to some trivial objections offered by Mr. Lambert de St. Bris, to bring the discussion concerning the origin of the name "America" to a close, and to express the hope that the question would never make its appearance again on the programme of a Congress."

This is well. It was time to have done with Mr. Marcou's vagaries, and to dismiss the person who has pushed himself into view as T. H. Lambert, Thos. de St. Bris, and Lambert de St. Bris, and has wasted in the search for Amaracapaná the golden years that should have been spent in looking for his own name.

THE ART OF DISCOVERY.—Mr. H. W. Seton Karr is winning a reputation. He contributes to the February (1891) Number of the *Proceedings* of the Royal Geographical Society an article on "Explorations in Alaska and North West British Columbia," accompanied by a map, presumably his own, of "The Chilcat country, Alaska and British Columbia." The journey was made in 1890; the map is dated 1891. Of this map Dr. Aurel Krause writes from Berlin, under date of February 17, in these words: "To my amazement I recognized in this map, provided as it was with a pair of new names, a somewhat reduced but substantially faithful copy of the very map which my brother published in 1883, together with a detailed description of the Chilcat

country, in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, Bd. 18, Taf. IX." The identity is beyond question.

Dr. Krause found something to notice in the text of the article. Of Chilcat Inlet Mr. Seton Karr says, on p. 75, that it "was entirely unexplored as regards the passes into the interior as well as the interior itself. I must not forget to mention that one white man, Dr. Krause, had already ascended to a certain point and produced a fairly accurate map of the route he followed."

The *fairly accurate map* seems to have absorbed Mr. Seton Karr's attention, and to have left him no time for the perusal of Dr. Krause's twenty-one pages of detailed description in the *Zeitschrift*. If he had read the description of Chilcat Inlet, on p. 350, he might have thought twice before correcting the United States chart which, he says, "places the head of Chilcat Inlet some nine miles higher up the valley than is actually the case."

"This is," remarks Dr. Krause, "the single important point in which Mr. Seton Karr's map differs from that of my brother, whose determinations were accepted for the chart of the Coast Survey."

The explanation given in the *Zeitschrift* is that the mouth of the Chilcat River is an extended shallow estuary, which becomes a broad basin at time of high water, while at low tide it is a stretch of sand and pebbly shingle, over and through which run numerous little rills to the sea. Dr. Krause's *fairly accurate map* shows the river at high water.

Mr. Seton Karr discovered, in his ascent of the Chil-

cat River, a stream that flowed into it, and this stream he named the "Wellesley River." "I found afterwards," he says, "that it had an Indian name—Klaheena." This river appears on Dr. Krause's map as the *Tlehini*, in which the German *e* and *i* represent the English *a* and double *e*. Initial *k* and *t* are interchangeable in many uncultivated tongues, though Mr. Seton Karr apparently hopes that his readers will not remember this fact.

There are two ways of profiting by the labors of other men. One inspires confidence, the other absolute distrust; and Mr. Seton Karr has himself to thank, if his name at the head of an article, or on the title-page of a book, puts every man on his guard.

THE "SOCIETA AMERICANA D'ITALIA."—This Society was founded in 1888 and reorganized under the present constitution in September, 1890. It has for its objects the cultivation of American ethnography, anthropology, archæology, linguistics, history and natural history, and the encouragement of these studies in Italy. Italians and foreigners, wherever they reside, are equally eligible for membership, and are entitled to receive without charge the publications of the Society. The annual dues are 10 lire (\$2) and a single payment of 200 lire (\$40) secures a Life membership, free of dues. The publications are: A Year Book, containing the list of members, Transactions, etc., and Memoirs, separately issued, on subjects within the scope of the Society.

Forthcoming Memoirs are:

Constructions of the Native Americans, Voyages of the Zeni, by F. Borsari; Penal Systems of the Aztecs

and the Incas, D. De Pilla; Anthropological and Ethnological Studies of the American Aborigines, M. Centonze; Social and Political Organization of the Aztecs, F. Ciccaglione; Translation of the Quichua drama, *Ollantai*, E. Giunti; Unpublished MS. of the 17th Century on Mexico, N. Parisio; Translation of the Quiche drama, *Rabinal-Achi*, L. Patalano; Intertropical Zones of America (Studies of Comparative Climatology and Pathology), L. Sambon.

Many eminent men are on the Council of the *Società*, and the president is Prof. Ferdinando Borsari, the distinguished Americanist.

Until November, 1892, the headquarters will be in Naples, where the address of the Chief Secretary is: Dr. L. Sambon, via Gennaro Serra, 24, 1mo. po.

TYPE OF AN AMERICAN INDIAN IN AN ANTIQUE BRONZE OF THE LOUVRE.—Prof. Ad. de Ceuleneer, of the University of Ghent, has brought out a memoir, read to the *Académie royale de Belgique*, on the subject of a fragment of Cornelius Nepos, as illustrated by an antique bronze, No. 826 in the collection of Edmond Durand, purchased for the Louvre in 1825 by Charles X. This bronze is described in the catalogue as follows: "Bust of a slave, entirely shaven, with large loose ears. The top of the skull opens on a hinge and forms a cover. Above the ears are rings in which works a moveable handle made to represent the branch of a tree with nodes. A bucket (*situla*), about 8 inches in height."

The history of the bronze is unknown, but the workmanship of it is excellent, like that of the best epoch of

Roman art ; and M. de Ceuleneer thinks it may belong to the first century B. C.

The fragment of Cornelius Nepos has been preserved by Pomponius Mela and by Pliny the Elder. While the texts differ in the two writers, they agree as to the main incident : that a king, either of the Boti or the



Suevi, made a present to Quintus Metellus Celer of some Indians, who had been driven by tempests to the coast of Germany.*

* Pomponius Mela relates the story in these words. "Testem autem rei Quintum Metellum adicit, eumque ita retulisse commemorat : cum Gallia: proconsul praeesset Indos quosdam a rege Botorum dono sibi datos ; unde in eas terras devenissent requirendo, cognosse vi tempestatum ex Indicis aequoribus abreptos, emensosque quæ intererant, tandem in Germaniæ litora exisse."

De Chorographia, III, 5, 45 (ed. G. Parthey, Berol., 1867).

M. de Ceuleneer rejects the idea that these Indians could have reached the coast of Germany by sea, driven by stress of weather from any quarter of that part of the world known to the ancients as India. He is inclined to believe that the Louvre bronze and the story told by Nepos explain each other, and that the former represents the head of an American Indian from some part of the Northern States of the Union.

He has made an ingenious and learned argument on a slight basis, and while his conclusion is within the limit of the possible, it is reached by faith and not by sight. The connection between the text and the bronze *situla* is assumed, and the considerations which make against it seem to be overlooked. It is not unusual to find, in every race, individuals who present the characteristic features of a wholly dissimilar ethnic type; and a work of art, as M. de Ceuleneer himself has remarked, bears no such testimony as a skull. The artist shapes his material according to his whim, and modifies or creates a type, at pleasure.

The written authority on which M. de Ceuleneer relies is not beyond reproach. All the manuscripts of Pliny give the reading *a rege Suevorum*, while there are numerous variations in the sixty manuscripts of Pomponius Mela. The best codex of these sixty is the Vatican 4929, which gives *a rege Botorum*. This is the reading, also, of eleven other good manuscripts, but M. de

The account in Pliny is:

"Idem Nepos de septentrionali circuitu tradit Quinto Metello Celeri L. Afrani in consulatu collegæ, sed tum Galliæ proconsuli, Indos a rege Suevorum donatos qui ex India commerci causa navigantes tempestatibus essent in Germaniam abrepti."

Hist. Nat. II, 67.

Ceuleneer rejects it, because we have no knowledge of a people or a tribe by the name of *Boti*. The principle that is applied in one case may be applied in another. We have no record of a voyage like the one reported by Mela, and there may be more than one error in his text. He is, moreover, the sole authority for the tale, which he takes from Nepos, and Pliny merely repeats the statement of Mela.

Why may not the word *Indos* have been, in the first instance, a copyist's blunder for *Iernos* (Irish) or *Iberos* (Spaniards)? If it is not easy to believe that even an Irish or a Spanish vessel of the first century, B. C., could find its way to suffer shipwreck on the coast of Germany, it is less easy to believe this of a bark manned by North American Indians. The indefiniteness of the word, *Indos*, allows latitude for speculation. Europe to the north and east of the Baltic was an unknown world to the ancients. If there is any truth in the story of the slaves presented to Quintus Metellus Celer by the German king, they were, no doubt, men of a yellow or brown complexion, and they belonged, perhaps, to some tribe of the Finnish race.

THE GREAT FROST OF 1890-91.—A paper on this subject by Mr. C. Harding was read at a meeting of the Meteorological Society, London, on the 18th of February.

It was shown that over nearly the whole of the south-east of England the mean temperature for the period November 25—January 22, was more than 2° below the freezing point, while on the coasts of Kent, Sussex and Hampshire the mean was 32°. In the north of Scot-

land and the west of Ireland the mean was 42° . The mean for middle-southern England was more than 10° below the average. In the north of England it was less than 5° , and in Scotland less than 1° below the average. The lowest temperatures were $0^{\circ}.6$ at Stokesay, in Shropshire, and 1° at Waddon, in Surrey. The greatest cold was felt at the end of November.

At many places in England the frost was continuous night and day for twenty-five days, and in Regent's Park the skating was uninterrupted for forty-three days. The cold was more prolonged in the neighborhood of London than at any time for the last hundred years. In 1788-89 the frost lasted for 49 days; in 1794-95 for 52 days; in 1838 for 50 days; and in 1890-91 for 59 days.

TEMPERATURE AT ORENBURG.—Mr. Müller Matt, professor at the Lyceum of Tashkent, writes to the Paris Geographical Society, (*Compte Rendu*, N° 1, 1891), enclosing an extract from the Moscow *Viedomosti*, to this effect:

"Orenburg, Nov. 19. We have the most extraordinary weather, unlike anything hitherto known, and characterized by the most violent changes of temperature. We had a copious rain, with the thermometer at $37^{\circ}.4$ (Fahr.), and in *twenty minutes* the mercury fell to -22° (Fahr.). A party of 30 Kirghis on the way to Orenburg was overtaken by the rain, followed by the bitter cold, and the men froze on their horses. Ten of these men have been brought in, and we are now seeking for the others. Many horses and cattle have perished, and it is feared that every living creature on a train bound for this place may have been frozen.

"P. S.—Just now the weather is mild, and we had only had before this a few good frosts ; I hope, therefore, that M. E. Blanc has been able to make his way to Kashgar."

Orenburg is situated in $51^{\circ} 48'$ N. Lat., $55^{\circ} 12'$ E Long.

A VISIT TO ETNA.—M. Emile Chaix tells in a little pamphlet,* the story of an excursion made in July and August, 1890, to Italy and Sicily.

He is partly of Théophile Gautier's opinion, that the lands of the sun should be seen in the summer ; and he sketches with a firm touch the characteristic landscapes through which he passes on his way to Catania.

The smiling aspect of Etna, green from base to summit, disappointed him ; but he began to know the mountain better when he saw at Nicolosi the black mass of the lava-flood that buried a wide region in 1886. From Nicolosi a path leads up the mountain, directly, towards the north, to the Casa de' Cervi, which stands close to Monte Gemellaro, the crater formed in 1886. For a half hour the ascent was made between walls constructed of fragments of lava, which reflected the burning heat of the sun. The path then lay across a bed of lava, 250 years old, with a few tufts of grass and shrubs growing here and there, and covered more and more thickly, as the ascent continued, with a fine *coke*, which spreads around the Casa de' Cervi like an immense desert of black dust, out of which rises, on each side of the-house, a small clump of chestnuts. Monte

*Une Course à l'Etna, par Emile Chaix. Genève, 1890. The illustrations are from Mr. Chaix's photographs.

Gemellaro, which made its appearance in 1886 and threw out all this black dust, is a truncated cone, about five hundred feet in height, and composed of scoriæ, exactly like coke. The crater still emits sulphurous vapors and is lined with deposits, red, yellow and white; but the most magnificent coloring is seen in a *solfatara*, on the outer southern side of the cone. An explosion has laid bare a vertical wall above a mysterious cleft, and from this cleft issue various gases which have covered the wall with yellow, white, orange, red and violet incrustations, of extraordinary brilliancy, heightened by the ebony blackness of their setting.

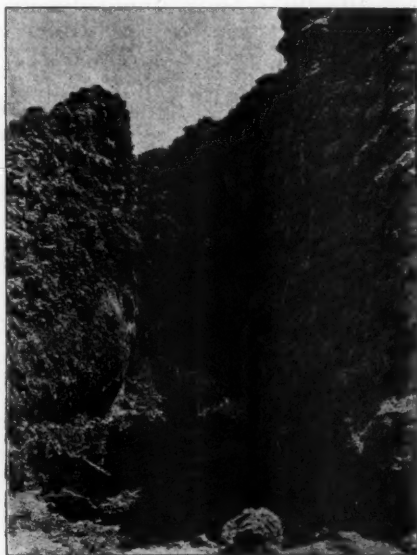
The lava issued from a line of *bocche* (literally, *mouths*). Near this line a sinking, in the direction of the lava-stream, has left a ravine three-fifths of a mile in length, with a width of from 100 to 160 feet, and a depth, varying from 12 to 40 feet. Its sides are vertical, or overhanging, and show alternate layers of compact lava and black scoriæ.

From this alternate arrangement it appears that the streams of lava flow out one after another and pass one above the other, each successive flow covering the scoriæ, or a part of the scoriæ, borne on the surface of the preceding flow; and while the layers of scoriæ that separate the lower strata of lava attain a thickness of not more than from eight to twenty inches, there are enormous heaps of loosely piled masses of coke, forming true moraines at the sides and extremities of the lava streams.

Nothing is more unlike a smooth floor than the surface of the lava.

It is formed of irregular clusters of brown or black

scoriæ of every possible size, and in every stage of cohesion, and split in all directions. Even with the stoutest shoes to defend the feet and an alpenstock in hand, the march over such a surface is full of dangers. The shoes are cut by the sharp points of the lava ; or a mass that seemed to be solid gives way under the foot ; or

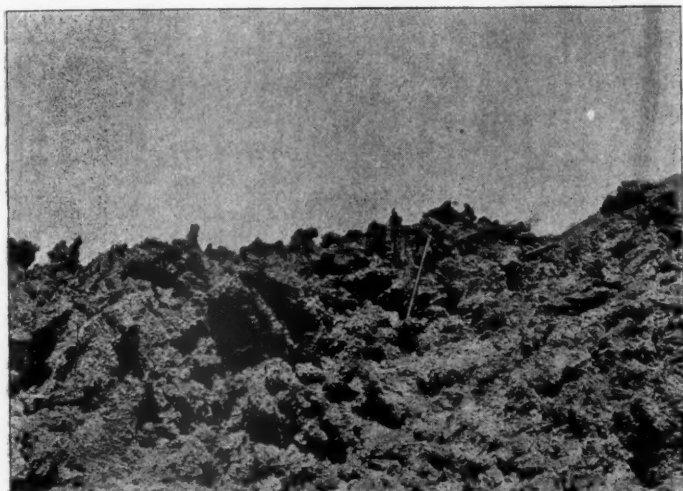


PRINCIPAL SOURCE OF THE LAVA STREAM (1886),
NEAR THE FOOT OF MONTE GEMELLARO.

the end of the alpenstock, planted to maintain the equilibrium, is driven through a softer crust, and its owner falls on the jagged surface, or into a deep fissure.

To the north of the Casa de' Cervi is the Casa del Vescovo, one of the spots at which snow is collected to supply the demand for the city of Catania. The snow-

drifts in the ravines are covered by the proprietors with seven or eight inches of volcanic sand, and this suffices to preserve the mass for several successive summers. The snow is cut out as wanted, in blocks of about 200 pounds. Each block is put in a bag, with a few dry leaves at the bottom, and covered at the mouth with



THE SURFACE OF A RECENT CURRENT OF LAVA—OF 1886.

ferns ; and there is almost no loss of weight by melting. The cost of the bag of snow to the carrier is one franc. Two bags are a load for a mule, and they bring five francs at Nicolosi.

Mr. Chaix climbed beyond the Casa del Vescovo to the crest of the Serra del Solfizio, (in the Valle del Bove) from which point he enjoyed a view that took in the Valle del Bove, with steep walls of rock, 4,000 feet

long, below and in front of him, the great cone of Etna on the left, and on the right the coast-line and the sea, and beyond, Calabria and the infinite horizon.

The view from the summit (10,870 feet above the sea, according to the latest measurement) is hardly to be matched.*

The crater of Etna has a circumference of a mile and a quarter, and a depth of from six to eight hundred feet, with almost vertical sides, covered with sulphur-yellow deposits from the gases constantly emitted. Nothing can be more desolate than the aspect of the mountain-top. It is a heap of lava and scoriæ and ashes, which the snow has changed into tufa, and is channelled by the rain, especially on the eastern side. On the other sides the black lava predominates, and everywhere the ground is covered with loose fragments in the form of pebbles, which slip and roll under the feet.

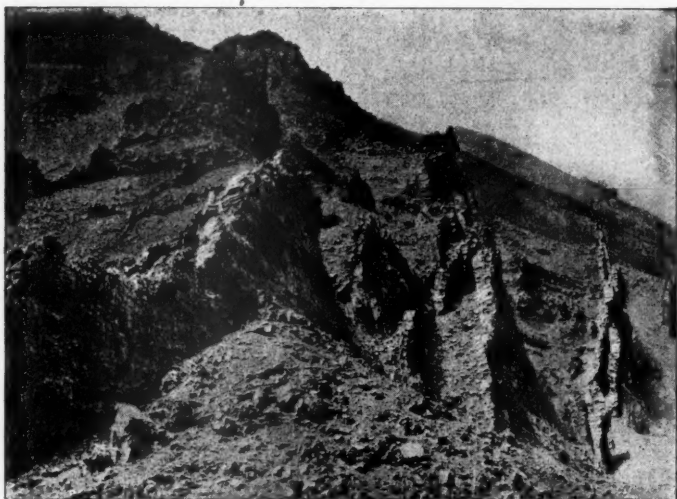
On the eastern side of the volcano lies the Valle del Bove, a great ravine, or valley, which extends from the base of the cone half way down the mountain.

* The panorama is described by Dr. Weigand, who made the ascent not long before Mr. Chaix :

"The moon and the stars faded, and the coming of the sun was announced by the deepening red of the eastern sky. We saw below us, as on a map, the Ionian Sea, the peninsula of Calabria, and the Gulf of Taranto, and near at hand the Strait of Messina ; to the north the dark mass of the Faro Mountains looked like a chain of low hills, and in the Tyrrhenian Sea rose up a great cloud of smoke and vapor, through which we made out the form of the unresting Vulcano, in the Lipari Islands. Beyond, the north coast of Sicily stretched to the western horizon, and the eye rested on Monte Pellegrino, the mountain from which, near Palermo, we had caught our first glimpse of Etna. The line of the southern coast was clearly seen, and the whole island, with its white-shining cities and villages, nowhere broken by breadths of forest, lay in the golden-red sunlight, and projected on this in strong contrast was the deep blue of the perfectly-formed, triangular shadow cast by the mountain on the country at its base."

XII Jahresbericht des Vereins für Erdkunde zu Metz für 1889-90.

This valley, which is shaped like a horse-shoe, is nearly six miles long, with a breadth of two and a half miles at the lower, and nearly four miles at the upper end. It is open towards the E. S. E., and sinks gradually in that direction from a height of nearly 10,000 feet to less than



VALLE DEL BOVE.

DENUDED ANCIENT ERUPTIVE VEINS, FROM 3 TO 15 FT. THICK, OF PHONOLITE, PYROXENITE, DOLERITE AND BASALT.

2,000; and farther down the rampart disappears under the beds of lava and tufa that slope to the sea.

Mr. Chaix explains the origin of the valley in these words :

“It is probable that the valley is the result of the combined action of eruption and erosion, the former having been much the more important force. The layers of lava and scorix which form the southern and

northern outer slopes of the valley have a very regular inclination (some 30°), like that of a pyramid with its apex high above the centre of the actual valley. The Monte Calanna, Rocca Musarra, etc., which close, on the east, the central lava plain of the valley, before the lava cataract begins, are formed of the same materials, with the same relative position towards the valley. This is also the case with the lower layers on the western side, the upper ones having a direction towards the present central cone. This formation precludes the idea of *mere explosive* and *mere erosive* action, because had there been such action, the primitive layers would occupy their primitive position, with a general gentle slope towards the east. The contrary is the case. Their composition and inclination are exactly those of eruptive cones formed, like the cone of Vesuvius, of layers of lava and pumice, deposited over one another through long periods, and with one common centre; only, in the Valle del Bove, the layers are denuded of all the loose materials which compose the edge or upper wall of an active crater. Regarding the destruction of the eastern brim of the Cratere del Bove, it must have been caused by the exit of lava through the base of the unconsolidated brim. The flow of lava in such cases, which often occur, bears away on its surface all the superincumbent material and leaves a wide breach in the enclosing wall. A striking example of this action is seen in the Monte Nero Settentrionale (southwest of Linguaglossa), which is open on the north side down to the level of the lava stream, which flowed from it in 1646. The eastern wall of the Cratere del Bove would have yielded more easily to such a flow, because it was

probably weaker than the others, as the general lowering of the layers on that side seems to indicate. It is not necessary to suppose that volcanic action ceased in the Cratere del Bove immediately after the breach in the eastern wall. The regular little ridge (now overflowed with lava), which extends across the valley between Rocca Palembe and Musarra, Monte Calanna and Zoccolaro, and from which flowed the lower cataract of lava, may very well be a new wall formed by later eruptions, in the place of the one which had been borne down. When volcanic action had ceased in the Cratere, it must have presented, as all extinct craters do, the aspect of a large circular funnel. Erosion began to fill it up with the loose materials of the sides, laying bare, in this way, all earlier eruptive veins; and the process was helped by eruptions of the new more westerly cone, from which descended streams of lava, that filled the pit to the level of the little eastern brim and then passed over it. The most ancient stream visible from under the more recent ones dates from 1284; but older streams, now invisible, may exist below the unbroken crust of the newer lava. There is, about half a mile to the eastward of the Casa Etnea, a little crater which is now filling up in the way described. It is already changed into a little plain, by the inflow of lava from the central cone. Let this flow continue, and the brim will be covered, and then we shall find a plain of lava ending on the eastern side in a downpour, inclined at an angle of nearly 30° ; an exact reproduction of what is seen at the eastern end of the Valle del Bove."

The bed of the valley is formed of three successive, nearly horizontal strata, each about 1,600 feet

thick, and composed entirely of lava, and more particularly, of lava from the eruptions of 1792, 1802, 1811, 1819, 1838, 1842, 1852 and 1869; but below these currents there are others, much more ancient; the valley, originally far deeper than it is at present, having been gradually filled from age to age. The sides are rocky crests, separated by beds of detritus, and formed of alternate layers of lava and tufa, cut into by erosion and crossed in every direction by great vertical walls of hard rock with a crackled surface (green pyroxenite, phonolite, etc.).

The Valle del Bove is what remains to us of the primitive biography of Etna. The eruptive cone changed its place, from one period to another, and each eruption made its contribution to the accumulation of lava, ashes and scorix, which forms the body of the volcano. The history of to-day shows the past history. With every eruption fissures run from the great cone like so many converging lines. These fissures are soon filled with liquid lava below and with the scorix on top, and in process of time the work of erosion removes the lighter materials and leaves the hard lava ridges.

Mr. Chaix found the Valle inhabited by shepherds, whose honesty and simplicity filled him with admiration. They lived in a circular dwelling constructed of stones, with a roof made of broom, and supported in the centre by a wooden pillar. Near the dwelling was the larder, made of twigs and branches and supported on four posts about seven feet high, to keep the provisions beyond the reach of the dogs; and beyond this were three or four enclosures, built of large stones, for the sheep.

The higher region of the northern side is the most interesting portion of Etna, so far as modern volcanic phenomena are concerned. The base of the great cone is still cracked and shows a range of active vents, with a stream of lava a mile and a quarter in length. Here also is Baron Waltershausen's prehistoric "elliptical crater," of two and a half miles in diameters; and the innumerable craters and vents, the crevasses, the labyrinths of rivers and cataracts of lava, leave an ineffaceable impression of grandeur and destructive energy.

TIME-RECKONING IN THE PHILIPPINES.—Capt. Jerolim von Benko, of the Austro-Hungarian Navy, has brought out in separate form, under the title, *Das Datum auf den Philippinen*, a paper contributed by him to the work, *Die Schiffsstation der k. u. k. Kriegs-Marine in Ost-asien*, of which it forms the thirty-second chapter.

The subject is the change of time-reckoning in the Philippine Islands, and to introduce it Captain von Benko states some elementary principles. For all places situated on the same meridian midday occurs at the same instant. Midday comes earlier for places to the east of a given meridian, and later for places to the west of it, each degree of longitude being equivalent to a difference of four minutes of time. For instance: if it is 8 o'clock A. M. on the first of January, at Vienna, what is the hour of the day at the antipodes, 180° from Vienna? Calculating the meridians toward the east the hour will be 8 P. M., on the first of January; but calculating toward the west the answer will be 8 P. M., on the thirty-first of December. Whatever prime meridian be adopted, there will be a difference of a day in the time-

reckoning of the hemispheres divided by the anti-meridian.

The Philippine Islands belong to the hemisphere which includes Europe, but up to the year 1845 the Philippine calendar was one day behind that of the Eastern hemisphere. This difference dated from the year 1571, when Legaspi, coming from Spanish America, took possession of the Islands and founded the colony; and it was unobserved for more than two centuries, because the communication between the Philippine Islands and Europe was maintained through the port of Acapulco. This communication was cut off by the independence of Mexico, and the progressive development of Oriental commerce by way of the Cape of Good Hope made the double date more and more of a burden; and on the 16th of August, 1844, the Captain-General Claveria issued, in concert with the Archbishop of Manila, a decree which suppressed Tuesday, December 31, 1844, and declared the day following Monday, December 30, to be Wednesday, the 1st January, 1845.

Captain von Benko has called attention to this history, because he finds that, not only are the encyclopædias in error on the point, but even such geographers as Oscar Peschel and Rudolf Falb refer to the Philippine peculiarity of date as if it were still in existence.

Even the scientific men of the great *Novara* Expedition, though they explained the change of date at the crossing of the 180th meridian, failed to mention, in their account of the ship's visit to Manila in 1859, the correction of time-reckoning in the Islands.

Capt. von Benko rightly holds that error, supported by such authorities, must be openly refuted; and he

prints at the end of his pamphlet, the certified text of the Captain-General's decree, as follows :

SUPERIOR GOBIERNO DE FILIPINAS.

EXMO. É ILMO. SOR. :

Con esta fecha he decretado lo que sigue.

Considerando conveniente el que sea uniforme el modo de contar los dias en estas Islas á Europa, China, y demas países situados al Este del Cabo de Buena Esperanza, que cuentan un dia mas por razones que á todos son bien conocidas, vengo en disponer con acuerdo del Exmo. é Ilmo. Sor. Arzobispo, que por este año, solamente, se suprima el Martes 31 de Diciembre, como si realmente hubiese pasado, y que el siguiente dia al Lunes 30 del mismo se cuente Miercoles 1^o de Enero de 1845, que es con el que empezará el Calendario de dicho año en el cual ninguna alteracion se necesita hacer.

Y lo comunico á V. E. I. para su conocimiento y efectos consiguientes. Dios gue á V. E. I. m. a.

NARCISO CLAVERIA.

Manila, 16 de Agosto de 1844.

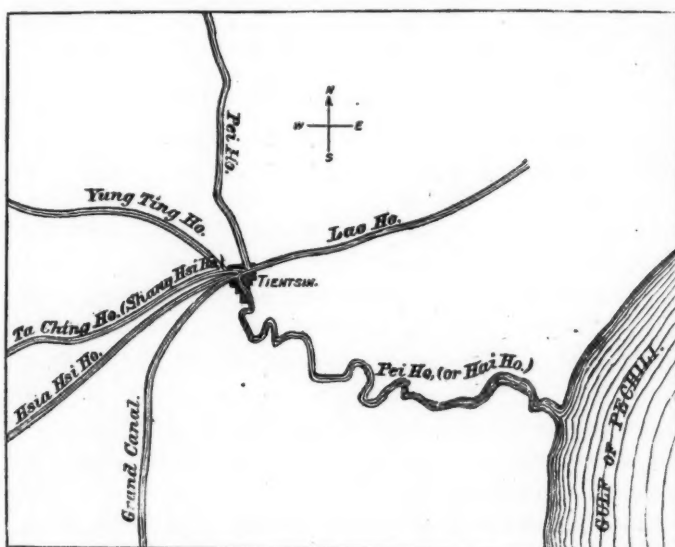
Exmo. é Ilmo. Sor. Arzobispo deesta Diócesis.

THE FLOODS IN NORTH CHINA.—No. 122, of the *Reports from the Consuls of the United States*, contains an account of the floods around Tien-Tsin in July, 1890. With his report Consul Bowman sends the accompanying sketch of the river-courses in the neighborhood of the city.

The rains began July 7, about the usual time for the opening of the rainy season. There fell that day 5.54 inches ; and on the six days, from the 16th to the 21st, 22 inches ; the average rainfall for the year at San Francisco. A quantity of water equal to the year's supply fell in less than a month.

By the 20th of July it was seen that a catastrophe was at hand, and the next day the river banks gave way on the eastern and western sides. On the East the plain was covered with water as far as the eye could reach, while on the western side part of the French concession was inundated and many Chinese houses

were swept away. These breaks did not relieve the pressure, for they were both below the junction of the rivers. On the 22d the levees of the Grand Canal, at about 7 miles from Tien-Tsin, broke, and this saved the city from destruction. "At present," (Sept. 4, 1890), says Mr. Bowman, "the foreign settlement and the native city of Tien-Tsin are like an island in the midst of the



waters. The suffering of the villagers is extreme ; their crops and in many cases their houses are entirely destroyed."

The Relief Committee, after exploring in all directions, reported in August, that all the country, as far as the sea to the east, and for a distance of from 40 to 60 and 100 miles to the west, north and south, was under

water, 8 feet in depth in some places. There were at one time 30,000 refugees, mostly women and children, in Tien-Tsin.

There is a central organization, called the Ch'ou Chen Chü, through which official assistance is distributed. This Committee collects information and receives reports from the outlying districts; and private charitable institutions, by co-operating with this central office, are enabled to know in what quarter their assistance may best be bestowed. Relief is given, first, to children and old men, next to women, and last to able-bodied men; and no attempt is ever made to exact any work from those relieved. It is felt that when a calamity occurs, over which the people have no control, it is their right to be fed by the authorities.

THE POLITICAL PARTITION OF AFRICA.—Under this title Mr. J. Du Fief describes, in a recent *Bulletin* of the Belgian Geographical Society, the African territories held or claimed, whether as colonies or as *spheres of influence*, by the European Powers. These Powers are: Belgium, England, France, Germany, Italy, Portugal, Spain and Turkey.

Belgium claims the Congo Free State, which is bounded by the French territory along the Congo and Ubangi rivers, the Portuguese territory of Angola, the English territory on the Zambezi and Lake Nyassa, the German territory along Lake Tanganyika, and the English territory on the Upper Nile.

ENGLAND possesses: in *West Africa*, Gambia, Sierra Leone, the Gold Coast, and Ashanti; the Delta and the middle course of the Niger, as far as Say, the river Be-

nue to Yola, Sokoto and Bornu up to Lake Tchad ; and in the Atlantic the islands of Ascension and St. Helena ; *in South and Central Africa*, Cape Colony, Natal, Pondoland, Basutoland, Zululand, Griqualand, Bechuana, a portion of the Kalahari Desert, the territories of the Bamangwato and the Matebele, and the region comprised between the Cabompo and the Zambezi rivers, the rivers Savi, Mazoe and Ruo, and Lakes Nyassa, Bangweolo, Moero and the southern end of Tanganyika ; *in East Africa and the Nile Basin*, the Protectorate of Zanzibar, the coast from the Wanga River to the Juba and the interior country, with half of the Victoria Nyanza, Uganda, and the region of the Upper Nile as far as Abyssinia, and a preponderating influence in Egypt ; *and in the Indian Ocean*, the Seychelles and Amirantes, Mauritius and Socotora.

FRANCE possesses : *in North Africa*, Algeria and the Protectorate of Tunisia, with a sphere of influence to the south across the Sahara as far as the Niger and Lake Tchad ; *in West Africa*, Senegambia and the basin of the Upper Niger, Grand Bassam and Assinia on the Gold Coast, Great Popo and Porto Novo, the territory of the Gabun and that of the Ogowe, or French Congo, lying between the Atlantic, the Portuguese territory of Cabinda, the river Congo above Manyanga, and the Ubangi River ; and *in East Africa*, Madagascar (Protectorate), the islands of Sainte-Marie, Réunion, Mayotte, Nossi-Bé and the Comoro group, and the district of Obock, on the Gulf of Aden.

GERMANY possesses : *in West Africa*, Togoland, on the Slave Coast, with Porto Seguro and Little Popo, and the Kamerun, lying between the Rio-del-Rey and the

Campo River, with a possible extension inland to Lake Tchad; in *South Africa*, Damaraland and Great Namaqualand, from the Cunene River to the Orange, with the interior as far as the 20th and 21st degrees of longitude, E. of Greenwich, and access to the Zambezi River, and in *East Africa*, the region along the Zanzibar coast from the Rovuma River to the Wanga, and the interior country as far as Lakes Nyassa, Tanganyika, and Victoria.

ITALY possesses: in *East Africa*, the zone along the shore of the Red Sea, from 18 degrees N. latitude to Raheita on the Strait of Bab-el-Mandeb, comprising in actual possession Massaua, and its environs, with Keren, Asmaro, and the islands of Dahlak, Assab, Bailul and Gubbi, and the rest under Protectorate, with Abyssinia in the sphere of influence; and the coast of Somaliland from the river Juba on the south to 10° N. latitude, with a sphere of influence to the interior as far as Shoa and Harar.

PORTUGAL possesses: in *West Africa*, the Azores, Madeira and Cape Verde Islands, some establishments on the coast of Senegambia (Cacheo, Bissao, Bolama, etc.), the islands of S. Thomé and Principe, the region of Cabinda, the Congo district and the province of Angola (including Loanda, Benguela and Mossamedes), and the interior as far as the Kwango or Cabompo and the Zambezi; and in *East Africa*, the province of Mozambique from Cape Delgado to the parallel of 26° 35' S. latitude, and bounded by Swaziland, the South African Republic, the rivers Savi and Mazoe, the Zambezi from Zumbo to the rapids of Caroa Bassa, the Ruvo River (which flows into the Shire) Lake Nyassa and the Rovuma River.

SPAIN possesses : in *North Africa*, Ceuta and Melilla, the Zaffarin islands, etc. ; and in *West Africa*, the Canary islands, the Coast of the Sahara from Cape Bojador to Cape Blanco, and the Adrar, the Bay of Corisco (in the Bight of Biafra), and the islands of Fernando Po and Annobon.

TURKEY possesses : the Province of Tripoli, and the suzerainty of Egypt.

The portions of Africa not yet subjected to foreign domination are : in *North Africa*, Morocco ; in *West Africa*, the Republic of Liberia and Dahomey ; in *South Africa*, the Orange Free State, the South African Republic, and Swaziland ; in the *Nile Region*, Nubia and Kordofan ; and in the *Interior of the Continent*, the Lybian Desert, to the S. of Barca, the country of the Tibbus, south of Fezzan, and Bagirmi, Waday and Darfur, in the Sudan.

M. Du Fief's paper presents also a chronological view of European occupation in Africa from the 15th Century to the year 1890, the history of the Congo Free State, the agreements (23 in number) between the occupying Powers, and the principal articles adopted for securing the freedom of commerce and the abolition of the slave trade.

Mr. E. G. Ravenstein gives, in *The Development of Africa*, by A. Silva White, the following estimates of the area and population of African countries :

		Sq. M.	Population.
Belgian	Africa	827,000	15,000,000
British	"	2,351,936	39,289,500
French	"	2,783,948	21,947,600
German	"	832,750	5,105,000
Italian	"	315,070	5,369,000

		Sq. M.	Population.
Portuguese Africa		909,820	5,513,900
Spanish "		246,760	444,000
Turkish : "			
Egypt 436,000 sq. m. 6,970,000 pop. }		836,000	7,980,000
Tripoli 400,000 sq. m. 1,010,000 pop. }			
Independent Africa :			
Liberia 37,000 sq. m. 1,050,000 pop. }			
Boer States 173,350 sq. m. 744,000 pop. }		2,411,023	26,389,370
Native States 2,120,323 sq. m. 24,595,370 pop. }			
Great Lakes 80,350 sq. m. }			
All Africa		11,514,307	127,038,370

Myvrian Archaiology: The Voyages of the Welsh to America. By B. F. De Costa.

Albany, 1891.

Under the name of Owen Jones's famous book, Dr. De Costa puts forth the testimonies as to the historical character of Madoc's Voyage. These testimonies cover, as he says, six important points:

1. That there was a well-known historic person named Madoc, the son of Gwynedd, Prince of Wales.
2. That he was a sailor, whose natural disposition drew him to adventures on the sea.
3. That this Madoc made westward voyages upon the Atlantic.
4. That after the first voyage, upon which he embarked more or less secretly, he was supposed to have been murdered, while, on trial, the accused man was cleared.
5. That he reappeared in Wales, raised a company of three hundred men and women, embarking the company in ten ships, with the intention of returning to the site of his colony.

6. That he sailed westward for the purpose of founding a colony and never returned.

These statements antedate the voyage of Columbus, and come down from a period when the Welsh were indifferent to discoveries on the Atlantic.

It is true, as Dr. De Costa admits, that neither Giraldus Cambrensis, nor Guttyn Owain, mentions the Voyage. The positive testimony is still sufficient to justify the conclusion that the subject is worthy of study, and beyond this Dr. De Costa, who is a scholar and a prudent man, declines to go.

Applied Geography: A Preliminary Sketch. With Eleven Maps and Diagrams. By J. Scott Keltie.

London, 1890.

Mr. Keltie proposes "to show what are some of the bearings of geographical knowledge on human interests; on the course of history, but more especially on industry, commerce and colonization."

The book is, he adds, a series of suggestions and examples, which may be of use to teachers, and may have some interest for intelligent readers generally.

Mr. Keltie's name gives assurance of good work, and this little book will help many who think they have passed on into the narrower circle of special readers.

Americans, given to what is known as "spread-eagleism," may see their own fault as in a magnifying mirror in the description of the British Empire at pp. 91-92, and enjoy, perhaps the unconscious humor of the following passage:

"From our standpoint as subjects of the Queen, we might divide the world into two parts; ourselves on one

side and the rest of world on the other—the British Empire and Foreign Countries.”

The maps and diagrams by Mr. E. G. Ravenstein admirably illustrate the text.

In and Out of Central America and Other Sketches and Studies of Travel. By Frank Vincent. With Maps and Illustrations. New York, 1890.

Mr. Vincent is an entertaining traveller, who sees for himself and honestly believes what he writes, even if he does not always see things in the true light.

The fondness for travel he shares with many of his countrymen, but he is one of the few who take the pains to publish their observations.

About half the present volume is devoted to Central America and the aspects of life in its principal towns and along the routes of travel.

The other sketches are “A Rival to Solomon’s Temple” (the Cambodian ruins), “Quarantined in the Antilles,” “An Oriental Monster” (Theebau), “An Exiled Emperor” and “White Elephants.”

OBITUARY.

M. Jean-Baptiste-Joseph Liagre, ex-President and Honorary President of the Belgian Geographical Society, of Brussels, died in that city January 12, 1891, at the age of 76 years.

One of the Founders of the Society and always devoted to its interests, M. Liagre enjoyed the affection and respect of all men for his just and kindly character, no less than for his high intelligence and the wide range of his acquirements.

TITLES OF PAPERS IN GEOGRAPHICAL JOURNALS.

BERLIN.—*Gesellschaft für Erdkunde, Verhandlungen.*

Travels in the Cordillera of the Argentine Republic (Dr. Brackebusch)—On Northern German-Africa (Dr. Baumann).

Zeitschrift.

Report of a Journey through Northern and Middle Greece (Dr. Philippson).

EDINBURGH.—*The Scottish Geographical Magazine.*

Anniversary Address. Rivers, Plains, and Mountains. (By E. G. Ravenstein)—Our Commercial Relations with China (Prof. R. K. Douglas)—Examination Scheme of the Royal Scottish Geographical Society—A Journey to Tashkent—The Physical Conditions of Central Asia in Relation to Russian Colonization (Lieut.-Gen. Annenkoff)—On the Scientific Results of Dr. Nansen's Expedition (Prof. Geikie)—Obituary: 1890.

GOTHA.—*Petermanns Mitteilungen.*

Hermann Berghaus (by Dr. H. Wagner)—From the Albert Nyanza to the Victoria Nyanza, 1886 (Dr. W. Junker)—The German Solomon Islands, Buka and Bougainville (H. Zöller)—The State of S. Paulo, Brazil (Dr. H. Lange)—Deep-Sea Explorations in the Black Sea, 1890 (Dr. A. Woeikoff)—The Water-shed of the Baltic Flats.

LONDON.—*Royal Geographical Society, Proceedings.*

On Matabele and Mashona Lands—The Tashkent Exhibition, 1890—Lands of the Globe still Available for European Settlement (E. G.

Ravenstein) — Explorations in Alaska and North-west British Columbia—Notes on the Country lying between Lakes Nyassa and Tanganyika — The Russian Expedition to Central Asia under Colonel Pevtsoff.

MADRID.—*Sociedad Geográfica de Madrid, Boletín.*

El Ksar-el-Acibir (Teodoro de Cuevas)—Portugal and England in South Africa (Rafael Torres-Campos)—Report on the Work and the Condition of the Society—Memoir on the Progress of Geography (Martin Ferreiro)—The Providence Islands (Arrecifes) in the Caroline Archipelago—Gibraltar.

PARIS.—*Société de Géographie, Compte Rendu.*

M. Müller Matt: Letter on the Temperature of Orenburg and on the Crickets in the Caucasus —M. Ed. Blanc in Central Asia—Chung-King, a new Chinese Port—Exploration in Laos—Navigability of the Me-Nam-Khong—The Trans-Saharan Railway—The Catholic Mission of Kilimanjaro—Dr. Catat in Madagascar—Dahomey and Porto Novo—M. Jules Garnier in North America.

Bulletin.

The Territory in Dispute between France and Brazil—The Kingdom of Assinia (Senegal)—From Zanzibar to the Station of Kondoia (50 miles S. E. of Mpwapwa)—A Note on Tobruk (Coast of Barca)—Studies in Historical Geography on the Ancient Routes across the Pamir—Travels in Central Asia and on the Pamir (Bonvalot)—The Pamir and the Chitral

(Valley on the road from India to Turkestan)
—Paul Crampel's Journey in the Northern
French Congo.

ROME.—*Società Geografica Italiana, Bollettino.*

Honors Paid to Antonio Raimondi—Hermann
Berghaus—On the Lack of Italian Cartograph-
ers, and Some Gaps to be filled in the Course
of Instruction—Letters from Entotto; one of
King Menelek, the other of Dr. Traversi—
Recollections of a Sojourn in the Harar—
Bricchetti-Robecchi's Botanical Collections
from Somaliland—The Initial Meridian and
the Universal Hour—The Observatories of
Etna and Catania.

WASHINGTON LETTER.

WASHINGTON, MARCH 15, 1891.

GEOGRAPHICAL RESULTS OF THE CENSUS.—Mr. Henry Gannett, in charge of the geographical work of the eleventh census, says* that the areas of the States and Territories are identical with those published by the tenth census excepting as they have been modified by the following territorial changes:

- (1) The formation of the Territory of Oklahoma.
- (2) The division of Dakota into North and South Dakota.
- (3) The transfer of a small part of South Dakota to Nebraska.

The gross area is 3,025,600 square miles, of which 2,970,000 is land surface and 55,600 water surface. The areas of the counties have been thoroughly examined and revised.

According to the same authority† the mean annual temperature of the United States, excluding Alaska, is 53°. The greatest density of population naturally centres on this pivot, ranging from 50° to 55°. From this, as a maximum, the density of population rapidly diminishes with the increase or decrease of temperature. The most rapid proportional increase has taken place at the two extremes, where it has trebled between 1870 and 1890, while in the same time it has increased but about 50 per cent. in the most densely settled group.

* Census Bulletin No. 23.

† Census Bulletin No. 33.

The influence of rainfall* is shown in the fact that the main body of the population inhabits the region in which the annual rainfall is between 30 and 50 inches, three-fourths of the inhabitants, or thereabouts, being found there. On either side, as the rainfall increases or diminishes, the population diminishes rapidly. The arid region of the West, where the rainfall is less than 20 inches—a region which comprises two-fifths of the entire area of the country—contains at present less than 3 per cent. of the population. The most rapid *increase*, however, has been where the rainfall ranges from 20 to 30 inches; that is, in the eastern portion of the great plains ranging from Texas to Dakota, where the density has increased in twenty years from 1.6 to 8.1.

Mr. Gannett further says,† that the centre of population in 1890 was in the following position :

Latitude $39^{\circ} 11' 36''$

Longitude $85^{\circ} 32' 53''$

It rests in southern Indiana, at a point a little west of south of Greensburg, and twenty miles east of Columbus, Indiana. To those who have not access to the *Bulletin* referred to the following extracts will be interesting :

In 1790 the centre of population was at $39^{\circ} 16.5' N.$ lat. and $76^{\circ} 11.2' W.$ long. or, about twenty-three miles east of Baltimore. Between 1790 and 1800 it moved almost due west to a point about eighteen miles west of the same city, being in lat. $39^{\circ} 16.1'$ and long. $76^{\circ} 56.5'$. From 1800 to 1810 it moved westwardly and

* Census Bulletin, No. 32.

† Census Bulletin, No 34.

slightly southward to a point about forty miles north-west by west from Washington, being in lat. $39^{\circ} 11.5'$ and long. $77^{\circ} 37.2'$. From 1810 to 1820 it moved westward and again, slightly southward to a point sixteen miles north of Woodstock, Va., being in lat. $39^{\circ} 5.7'$ and long. $78^{\circ} 33'$. From 1820 to 1830 it moved still further westward and southward to a point about nineteen miles south-west of Moorefield, W. Va., being in lat. $38^{\circ} 57.9'$ and long. $90^{\circ} 16.9'$. From 1830 to 1840 it moved still further westward, but slightly changed its direction northward, reaching a point sixteen miles south of Clarksburg, W. Va., being in lat. $39^{\circ} 2'$ and long. $80^{\circ} 18'$. From 1840 to 1850 it moved westward and slightly southward again, reaching a point about twenty-three miles south-east of Parkersburg, W. Va., in lat. $38^{\circ} 59'$ and long. $81^{\circ} 19'$. From 1850 to 1860 it moved westward and slightly northward reaching a point twenty miles south of Chillicothe, Ohio, in lat. $39^{\circ} 0.4'$, long. $82^{\circ} 48.8'$. From 1860 to 1870 it moved westward and sharply northward, reaching a point about forty-eight miles east by north of Cincinnati, Ohio, in lat. $39^{\circ} 12'$, long. $83^{\circ} 35.7'$. In 1880 the centre of population had returned southward to nearly the same latitude which it had in 1860, being lat. $39^{\circ} 4.1'$, long. $84^{\circ} 39.7'$. During the past decade it moved northward into practically the same latitude which it occupied in 1870, its present position being as already stated lat. $39^{\circ} 11' 56''$, long. $85^{\circ} 32' 53''$.

The closeness with which the centre has clung to the parallel of 39° cannot fail to be noticed. The most northern point reached was in 1790, the most southern in 1830. The extreme variation in latitude has been

less than 19 minutes, while the movement in longitude has been nearly 9.5 degrees, or a total westward movement of 505 miles.

The movement by miles is shown in the following table:

1790.	23 miles east of Baltimore, Md.....	
1800.	18 miles west of Baltimore, Md.....	41 miles.
1810.	40 miles north-west by west of Washington, D. C.....	36 "
1820.	16 miles north of Woodstock, Va.....	50 "
1830.	19 miles west-southwest of Moorefield, W. Va.....	39 "
1840.	16 miles south of Clarksburg, W. Va.....	55 "
1850.	23 miles south-east of Parkersburg, W. Va.....	55 "
1860.	20 miles south of Chillicothe, Ohio.....	81 "
1870.	48 miles east by north of Cincinnati, Ohio.....	42 "
1880.	8 miles west by south of Cincinnati, Ohio.....	58 "
1890.	20 miles east of Columbus, Ind.....	48 "

The centre of the area of the United States, excluding Alaska, is in northern Kansas, in approximate latitude $39^{\circ} 55'$ and approximate longitude $98^{\circ} 50'$. The centre of population is, therefore, about three-fourths of a degree south and more than seventeen degrees east of the centre of area.

UNITED STATES BOARD ON GEOGRAPHIC NAMES.—At the request of the Census office the Board has prepared a list of the names of counties in every State and Territory of the United States, officially corrected. The spelling in the census reports will conform to that adopted by the Board, and will also be adopted by the Post Office Department and all other branches of the Government. Subsequent editions of the Postal Guide will be corrected to correspond. This, the second Bulletin, will probably be issued the latter part of the present month.

HYDROGRAPHIC GEOGRAPHY.—Ensign James C. Drake, U. S. N., in his report on *The sounds and estuaries of*

*Georgia with reference to oyster culture** describes the length, width, course, and (with great minuteness) the depth of ninety-nine streams and sounds along the coast of the State included between latitude $32^{\circ} 03'$ and $30^{\circ} 43'$ north. Ensign Drake was an assistant to Lieut. Winslow, who for three years was engaged in a similar work on the coast of North Carolina. Seven charts accompany the report.

Mr. Tarleton H. Bean† in treating of the physical characteristics of the environment of the salmon, describes with particularity, several bays, rivers and lakes of the Kadiak group of islands, Alaska. Several original topographical and reconnoissance maps of the region accompany the report.

In the central region of the Atlantic Ocean, in the neighborhood of the Madeira and the Canaries, recent bathymetric surveys have developed three unsuspected peaks rising abruptly out of the ocean, which here sinks to a depth of more than 2,000 fathoms. These, named Dacia Bank, Seine Bank, and the Salvages, together with Enderbury Island in the central part of the South Pacific Ocean, and the un-named shoal within late years developed by the U. S. ships *Tuscarora* and *Ranger*, in the ocean to the westward of San Francisco, are taken as the basis of "An inquiry (by G. W. Littlehales, of the U. S. Hydrographic Office) into the average form of isolated submarine peaks, and the interval which should obtain between soundings taken to disclose the character of the bottom of the ocean."‡

* U. S. Coast and Geodetic Survey: Bulletin No. 19.

† Salmon and salmon fisheries of Alaska, 1890.

‡ Hy. Office Pub. No. 95, 1890.

The author says: "This inquiry is undertaken with a view of fixing the ideas of navigators as to the proper interval between deep sea soundings taken to develop the existence of important changes in the bed of the ocean, and also with a view of affording some means of making comparisons between the slopes of land and submarine peaks by deducing the equation to the curve which, by revolution around a vertical axis, would generate the average of the surfaces of the submarine peaks above mentioned."

The deep sea soundings which have been observed in each of these localities are shown on charts.

In twelve sketches * Mr. Henry L. Marindin of the U. S. Coast and Geodetic Survey demonstrates graphically the movements of the tide in filling and draining the tidal reservoirs surrounding New York City. In the text accompanying he says: "If they were no more valuable than in aiding the study of the question of the respective values of the bays and flats as tidal reservoirs in maintaining the channel ways through Sandy Hook bar, they would then have repaid the time and labor spent in preparing them."

BUREAU OF AMERICAN REPUBLICS.—This Bureau, of which Mr. W. E. Curtis is the director, is steadily engaged in gathering information that may be useful to producers, merchants, manufacturers and others interested in the development of commerce between the countries of the Western hemisphere. It should not be forgotten that the Bureau is available as a medium of communication for persons desiring reasonable infor-

* U. S. Coast and Geodetic Survey: Appendix No. 9, Report for 1888. Washington, 1890.

mation in regard to the customs, tariffs and regulations, and the commerce and navigation of the American republics.

The *Hand Book of the American Republics* is the title given to the first Bulletin of the Bureau, recently issued, and dated January, 1891. It is an attractive volume of 288 pages, well printed on good paper, with nine illustrations, four of which are maps. It has a geographical chapter, and one containing historical notes. The others relate to the commercial and economic features of Latin America. There will also be a series of bulletins devoted to descriptions of each of the American republics, their resources, industries, commercial advantages, customs, laws, and regulations. Also a code of nomenclature containing a list of all articles of merchandise imported and exported, with their Spanish and Portuguese equivalents. Mr. Curtis will appreciate any suggestions that may be offered for increasing the value of the bulletins and their usefulness in fulfilling the purpose for which they are intended.

COLON "NORTHERS."—Commander Converse of the U. S. S. *Enterprise*, explains that what is designated in Colon as a "norther" is not necessarily a gale of wind; in fact, the wind frequently does not blow home, and is at such times quite light, but a very heavy ground swell heaves into the bay. When the wind does blow home, no vessel can remain at anchor in safety. Nor is there any prediction of these dangers. The barometer gives no indication. In December, 1890, the port was visited by a very severe type of the norther,—a memorable one; and the only reason there was not more damage to record is the simple fact that there

were no sailing vessels present, and the harbor was comparatively clear. The norther was preceded by a heavy swell, but towards evening the swell decreased. Later in the night it commenced to heave in with great force, so that vessels were compelled to leave their wharves.

After daylight the full force of the norther began to be felt, and in a very short time it became so rough that all steamers put to sea. One steamer lying in the harbor with two anchors down, dragged nearly a mile before she could get sufficient steam to go to sea. The norther comes suddenly, and leaves no time for preparations, therefore during their "season" steamers are compelled to keep up steam constantly, ready to move at a moment's notice. It would be almost impossible to get up anchor without damage to the ship at such times.*

Mr. Everett Hayden, Marine Meteorologist of the Navy Department, commenting on this "norther," says: "The weather preceding the very severe norther in the Caribbean Sea from the 19th to the 21st of December last is illustrated by the above map [Pilot Chart of N. Atlantic, Jan. '91], which shows the conditions over the eastern United States, Mexico, and the western Atlantic, on the morning of the 17th. The conditions are typical of those that always accompany northers, which, it will be noted, are winds from an anticyclone central over northern Mexico and Texas, or even farther north, when there is a storm, or region of decidedly low pressure, moving up the Atlantic coast from about the Bahamas or the Gulf of Mexico. It will be seen from the above map that as the Texas anticyclone moved slowly eastward, the north-westerly winds in its front swept down

* *Notice to Mariners*, U. S. Hy. Off., Feb. 28, 1891.

through the Yucatan Channel, and, combining with the north-easterly winds prevailing over the Caribbean Sea, sent very heavy northerly seas into Colon. The name 'norther' is applied to the heavy sea, even though the wind itself does not reach as far south as Colon; in the present case, however, it doubtless reached far south of the isthmus, into the Pacific."

ETHNOLOGY.—Mr. Albert S. Gatschet has handed the Director of the Bureau of Ethnology, as the result of long and patient study, his report upon the Klamath Indians of south-western Oregon. This tribe from time immemorial has inhabited a country surrounded by mountain ridges upon the eastern slope of the Cascade range, in the south-western part of the territory now forming the State of Oregon. The two main bodies forming the people are the Klamath Lake Indians and the Modoc Indians; the latter well remembered on account of the "Modoc War" of 1872-73, the murder of Gen. Canby, etc.

This report, which is the long deferred volume 2 of *Contributions to North American Ethnology*, deals with the beliefs, legends, traditions, government, social life, and more extensively the language of this secluded people. An ethnographic sketch of one hundred pages is followed by texts of the Klamath language, with explanatory notes (about 200 pages), after which is a grammar, of about 500 pages. A second part of the work, soon to be issued, will contain the Klamath-English and English-Klamath dictionary. This work, by one of the most painstaking American ethnologists, constitutes the most extensive contribution to ethnographic science yet made in this country.

ALASKA BOUNDARY.—The surveying parties sent out by the Coast Survey at the instance of the Department of State for locating the boundary line at points on the Yukon and Porcupine rivers, at or near the 141st meridian of west longitude, having completed that work, the location of points in south-eastern Alaska, and the line of the "ten marine leagues from the coast line" will soon be commenced. The data and maps resulting from these surveys are designed to be used by the Government in the negotiation, adjustment, and definite settlement and location of the boundary between Alaska and British Columbia. When the results of this portion of the survey are made known, we shall have another and probably a final determination of the altitude of Mount St. Elias.

The late Congress did not sanction the plan of the Secretary of War for an exploration of Alaska by "a thoroughly equipped expedition."

PACIFIC CABLE.—During the closing hours of the last Congress the provision for cable communication between San Francisco and the Hawaiian Islands, which had been attached to the Diplomatic appropriation bill, fell into the hands of a conference ("trading") committee, and was lost.

This measure has been strongly urged by Presidents and Cabinets of both political parties and by the Foreign Affairs Committee of both Houses. Lieut. Richardson Clover, Hydrographer U. S. Navy, appeared by request before the Committee on Foreign Affairs on the 30th of January last, and made the following very clear argument :

"I will first state that the Sandwich Islands are the

key to naval and commercial supremacy of the Pacific. Looking on gnomonic chart of the Pacific, where straight lines are routes of great circle and consequently the shortest distance between two points, you observe that Honolulu lies directly on the line between San Francisco and Sydney, Australia. Now draw a line from Valparaiso to Yokohama and again you cross Honolulu. Not only are these the shortest routes but the most advantageous in all respects and are used to-day by both steam and sailing vessels.

“When the Nicaragua Canal is completed the importance of Honolulu will be much enhanced, for it lies directly in the route of all vessels bound to ports of Asia, though vessels from the China or Japan coast to the canal will find a better route farther north. Lay a straight line, from a point off the Pacific end of the Nicaragua Canal, on your gnomonic charts to Yokohama, and you will no doubt be surprised to see that this line or the great circle course runs directly up the west coast, passes about 300 miles from San Francisco, and skirts the Aleutian Islands. Along this route, between Japan and our own coast, the great Japanese or Kuro-siwo current, analogous to our Gulf stream, flows to our shores, and the prevailing winds are in the same direction: past Honolulu, on the contrary, there is a westerly current, and westerly winds prevail.

“In the long voyages necessary in the Pacific, these facts cannot be ignored by even high-powered steamers. The consequence will be that between the Nicaragua Canal and Yokohama vessels will naturally pass via Honolulu, and when making the passage this way will touch at San Francisco. Under such conditions, can

we afford to be without direct cable connection with Honolulu ? ”

Major Charles E. Dutton, U. S. A., who lately visited the Hawaiian Islands, made some highly interesting remarks at a recent meeting of the National Geographic Society. Major Dutton is a gentleman of very wide experience and an accomplished scientist. Among other things he said : That the main attraction to travellers is the two active volcanoes. They are of great volume and quite extraordinary, the main one (Mauna Loa) being probably the greatest individualized mountain mass in the world. He thinks that one's ideas as to volcanoes are changed materially in view of the Hawaiian phenomena. Mauna Loa is 14,000 feet above the sea level, but its slopes extend so far below the level of the ocean that if the mountain were measured as it rises from the bed of the sea, it would have a base area of one hundred and eighty miles in diameter and a height of 32,000 feet. Of the two vents, one is 10,000 feet lower than the main one. The eruptive action is quiet, infrequently showing any signs of explosiveness or of the terrible force that characterizes many historic volcanoes. This, he said, is due to the small amount of water and vapor in the midst of the lava. The lava wells out and flows over the surface of the country quietly. The mountain is in process of building. The slopes are very gentle, the steepest being only about seven degrees. Ascent is not difficult if one knows the way, otherwise it is next to impossible. The way is through lanes that have been formed between the lava streams. There are as yet no spurs, ravines or gorges, but when the fissures through which the rain sinks, have been cemented up,

the waters will make rivers, and gradually ravines and gorges will appear. The neighbor of Mauna Loa is Maunaka, an extinct volcano, a little higher, but steeper. He says that the landscape, aided by flowering trees and fronds of exceedingly large growth, is one of the most beautiful in the world, and that scenery of great grandeur is found on the mountains of Haliakala, the top of which, at some time or another has dropped out of sight, forming a great pit or gorge that rivals the glories of Yosemite.

The Hawaiian of the present day is not quite on a level with the whites of cultivated society, yet as a race the people are far advanced. Nearly all read and write in their own language, while an increasing percentage understand English.

ARTESIAN WELLS.—When Congress and the Director of the U. S. Geological Survey failed to agree, or held different views as to the methods to be employed to bring about practical irrigation in the arid regions of the West, the Secretary of Agriculture was directed to investigate and determine the proper location for artesian wells for irrigation purposes within the area west of the 97th meridian, and east of the foot-hills of the Rocky Mountains. The work was organized on a basis of engineering, geological and statistical inquiry, and covered an area of over 658,000 square miles.

The results found are, that the Dakotas have an artesian basin of vast extent, and that the physical geography of that region strongly testifies to the probable permanency of the water supply. It is believed that this basin is the largest and strongest yet discovered in the United States, or even in the whole world.

In the eastern portion of Wyoming a number of small artesian basins may be found. About sixty-five wells are reported in Nebraska. In the central section of the great plains region extending from the northern boundary of Nebraska to the southern boundary of the Indian Territory were found about 200 flowing wells, with several hundred more in which the water rises, but does not reach the surface. In Colorado four distinct artesian basins are reported, that of Denver alone containing about 350 wells. But the most remarkable basin in Colorado is just outside the west line of the investigation. Over 2,000 wells have recently been sunk in this basin. No basins of value have yet been developed in New Mexico. There are indications of an important artesian basin in the vicinity of Waco, Texas. There is a water-bearing stratum over 1,800 feet below the earth's surface, and about 1,200 feet below the level of the Gulf of Mexico. An 8-inch well, 1,834 feet deep, has a flow of 833 gallons per minute.

Facts and statistics bearing on irrigation have been collected by the Census Office, and Bulletin No. 35, recently issued, presents for the territory of Arizona the results of a careful and thorough investigation as to the extent to which irrigation is practised, the peculiar conditions prevailing in different localities, and the success that has so far attended the application of this system of agriculture, more particularly from the standpoint of the user of water.

EXPLORATIONS IN PALESTINE.—The directors of the Palestine Exploration Fund, London, having after the lapse of many years received during the past season permission from the Sultan, under certain restrictions, to

renew their excavations and researches in the Holy Land, made arrangement with Mr. Flinders Petrie, a well-known and successful explorer of Egypt, to carry on the work, the Mediterranean coast in the vicinity of Ascalon and Gaza being selected as the field of operations. Mr. Petrie's discoveries, though interesting, appear to be hardly up to his expectations, and in some respects were quite disappointing. It is probable the work may be continued another season.*

The number of visitors to Jerusalem during 1890 exceeded that of any previous year, Americans preponderated over any other nationality. The English were the next largest in number. In this statement no estimate is made of the large bodies of pilgrims who go there to worship.

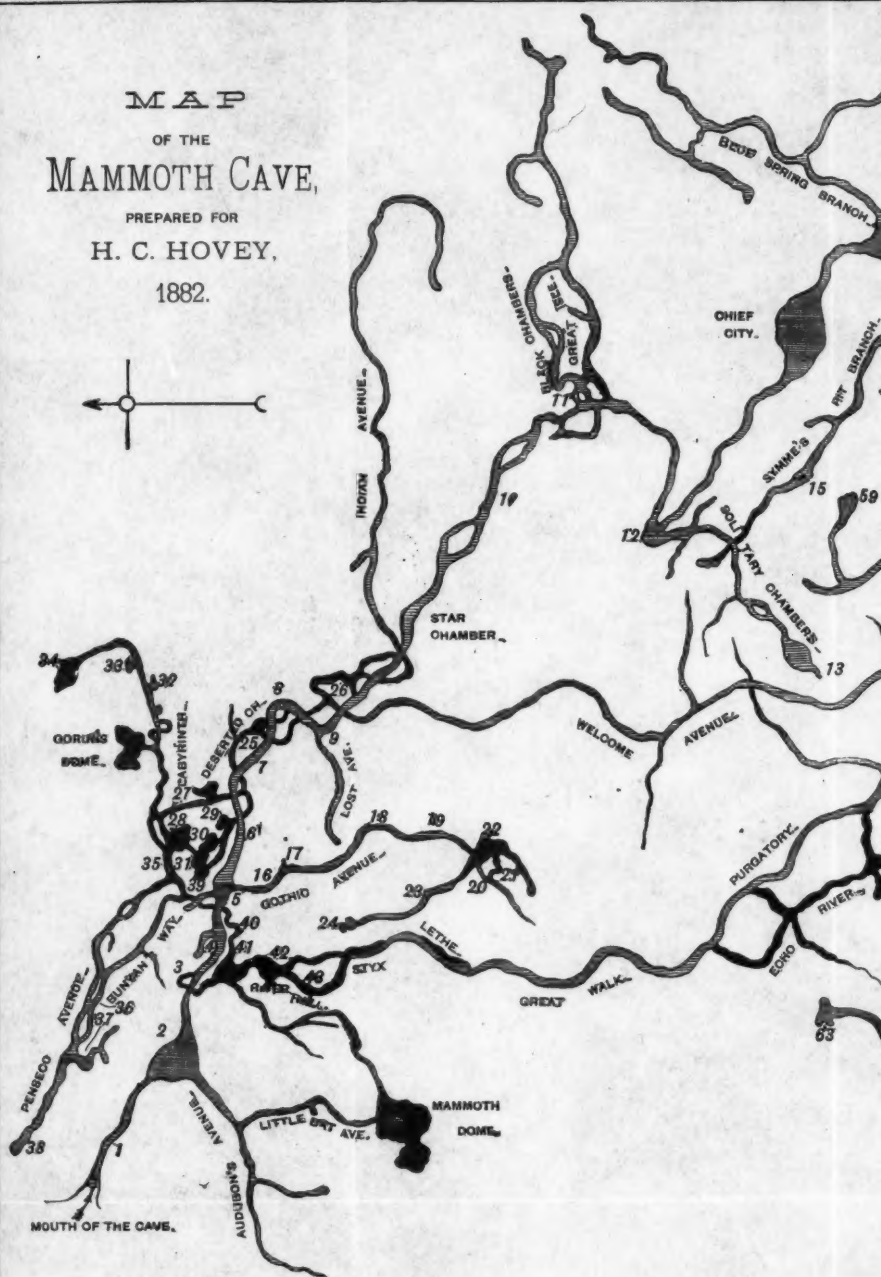
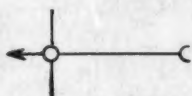
ICELAND.—In some notes on Iceland published in Edinburgh in the latter part of 1890, it is stated that few tourists visited the island last summer, and none at all the northern part, which by many is considered a more pleasant part for a summer holiday than the south. Travelling is difficult on account of the absence of roads and want of accommodations. Until quite recently there were bridle-paths only, and no proper roads. The first road made was begun about two years ago, and does not yet extend further than a few miles out of Reykjavik.

H.

*Consul Gillman to the Department of State.

MAP OF THE MAMMOTH CAVE,

PREPARED FOR
H. C. HOVEY,
1882.



MAIN CAVE.

1. The Iron Gate.
2. The Rotunda.
3. Kentucky Cliffs and the Corkscrew.
4. The Methodist Church.
5. Gothic Galleries.
6. Standing Rocks.
7. Grand Arch.
8. Giant's Coffin.
9. Acute Angle, and Cottages.
10. Proctor's Arcade.
11. Wright's Rotunda.
12. The Cataracts.
13. Fairy Grotto.
14. St. Catherine's City.
15. Symmes' Pit.

GOthic AVENUE.

16. Seat of the Mummy.
17. Register Hall.
18. Gothic Chapel.
19. The Arm Chair.
20. Lover's Leap.
21. Elbow Crevice.
22. Napoleon's Dome.
23. Lake Purity.
24. Annette's Dome.

DESERTEER CHAMBERS.

25. Wooden Bowl Room.
26. Black Snake Avenue.
27. Side-Saddle Pit.

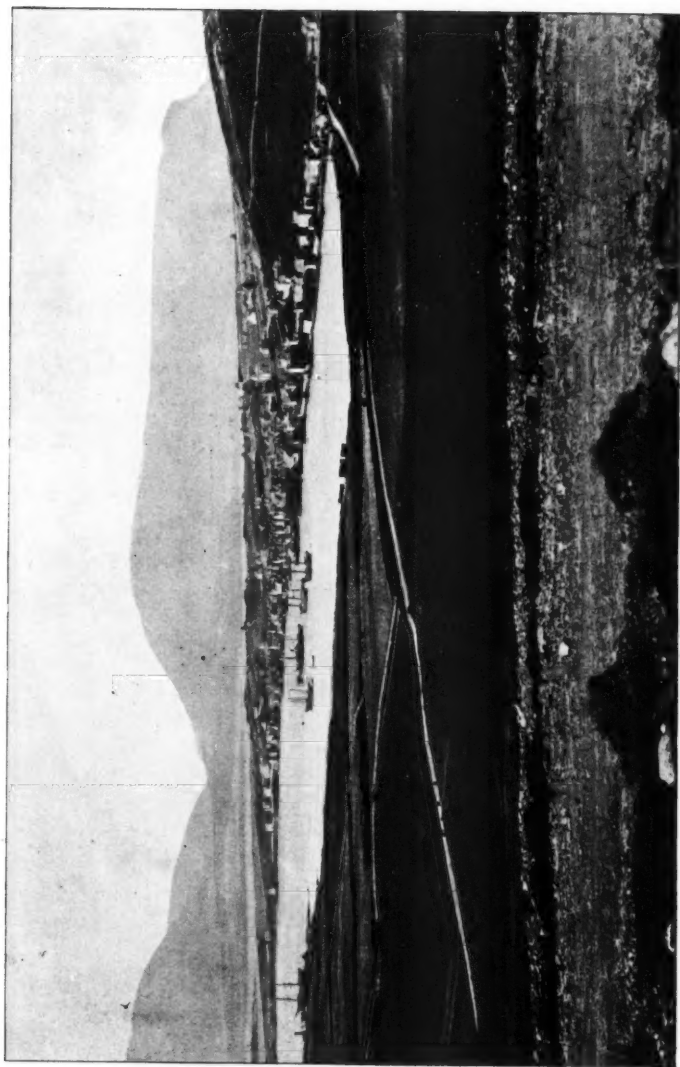
28. Bottomless Pit.
29. Covered Pit.
30. Seylla.
31. Charybdis.

LABYRINTH.

32. Putnam's Cabin.
33. Hovey's Cabin.
34. Ariadne's Grotto.

PENSICO.

35. Revelers' Hall.
36. Grand Crossing.
37. Pineapple Bush.
38. Angelica's Grotto.



STROMNESS, ORKNEY.